



Total Maximum Daily Load

for

Platte River

**Andrew, Buchanan, Clay, Clinton, DeKalb, Gentry, Nodaway, Platte,
Worth Counties**

303(d) Listing: *Escherichia coli* Bacteria

Submitted: June 2, 2025

Approved: June 18, 2025

WATER BODY SUMMARY
Total Maximum Daily Loads (TMDL) for Platte River
303(d) Listing: *Escherichia coli* (*E. coli*) Bacteria

Name: Platte River

Location: Andrew, Buchanan, Clay, Clinton, DeKalb, Gentry, Nodaway, Platte, Worth Counties

TMDL Development Priority: High

8-digit Hydrologic Unit Code (HUC):¹

10240012 – Platte

10240013 – One Hundred and Two

Water Body Identification (WBID) and Hydrologic Class:²

WBID 312, Class P

Designated Uses:³

Irrigation

Drinking water supply

Livestock and wildlife protection

Human health protection

Warm water habitat (aquatic life)

Whole body contact recreation category B

Secondary contact recreation



Location of watershed in Missouri

Impaired Use:

Whole body contact recreation category B

Pollutant Identified on the 2022 303(d) List:

Escherichia coli (*E. coli*) (fecal indicator bacteria)

Identified Sources on the 2022 303(d) List:

Rural nonpoint sources

Length and Location of Impaired Segments:

WBID 312 142.40 miles, Mouth to State Line

¹ Watersheds are delineated by the U.S. Geological Survey using a nationwide system based on surface hydrologic features. This system divides the country into 2,270 8-digit hydrologic units (USGS 2019). A hydrologic unit is a drainage area delineated to nest in a multilevel, hierarchical drainage system. A hydrologic unit code is the numerical identifier of a specific hydrologic unit consisting of a 2-digit sequence for each specific level within the delineation hierarchy (FGDC 2003).

² For hydrologic classes see 10 CSR 20-7.031(1)(E). Class P streams maintain permanent flow even in drought periods.

³ For designated uses see 10 CSR 20-7.031(1)(F) and 10 CSR 20-7.031 Table H. Presumed uses are assigned per 10 CSR 20-7.031(2)(A) and (B) and are reflected in the Missouri Use Designation Dataset described at 10 CSR 20-7.031(2)(E).

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1. Introduction

In accordance with Section 303(d) of the federal Clean Water Act, the Missouri Department of Natural Resources is establishing this total maximum daily load (TMDL) to address fecal contamination as indicated by high concentrations of the fecal indicator bacteria, *Escherichia coli* (*E. coli*), in the Platte River in Andrew, Buchanan, Clay, Clinton, DeKalb, Gentry, Nodaway, Platte, and Worth Counties. This TMDL report addresses one water quality limited segment included on Missouri's 2022 303(d) List of Impaired Waters due to exceedances of Missouri's *E. coli* bacteria criterion for the protection of the whole body contact recreation (category B).⁴ This listing was approved by the U.S. Environmental Protection Agency (EPA) on Aug. 2, 2023.⁵

Section 303(d) of the federal Clean Water Act and Title 40 of the Code of Federal Regulations (CFR) Part 130 require states to develop TMDLs for waters that do not meet applicable water quality standards. Missouri's Water Quality Standards at Title 10 of the Code of State Regulations (CSR) Division 20 Chapter 7, Rule 7.031 consist of three major components: designated uses, water quality criteria to protect those uses, and an antidegradation policy. A TMDL is equal to the loading capacity of a water body for a specific pollutant and represents the maximum amount of a pollutant that a water body can assimilate and still attain and maintain water quality standards. The *E. coli* bacteria loading capacity for the water body is derived from the maximum *E. coli* concentration allowed by Missouri's Water Quality Standards and is translated to mass loads using stream flow under all recorded conditions. Once the loading capacity of a water body has been quantified, existing and future point sources and nonpoint sources are assessed for their potential to contribute the pollutants of concern. In accordance with 40 CFR 130.2, contributing point sources are assigned a portion of the available loading capacity as a wasteload allocation and nonpoint sources are assigned a load allocation. As required by the federal Clean Water Act in section 303(d)(1)(C), a margin of safety is also included. Margins of safety can be explicit (numeric) or implicit (qualitative) to account for any lack of knowledge concerning the relationship between pollutant loading and water quality, uncertainty associated with the model assumptions, or data inadequacies (40 CFR 130.7). The TMDL for any given pollutant is the sum of the wasteload allocation, the load allocation, and the margin of safety.

2. Watershed Description

The Platte River watershed is located in northwestern Missouri and southwestern Iowa (Figure 1). The Platte River (WBID 312) originates about 3.25 miles northeast of Spaulding, Iowa. From there, the river runs south approximately 200 miles, 142.40 miles of which in Missouri, before flowing into the Missouri River. The total watershed area of the Platte River is composed of two 8-digit hydrologic unit code (HUC) subbasins: The One Hundred and Two Subbasin and the Platte Subbasin. The One Hundred and Two Subbasin is 776.44 square miles (mi²) and its 8-digit HUC is 10240013. The Platte Subbasin is 1,663.72 mi² and its 8-digit HUC is 10240012. The total watershed area of the Platte River is approximately 2,440.16 mi². The portion of the total watershed located in Iowa is approximately 786.28 mi² and the larger portion in Missouri is approximately 1,653.88 mi².

⁴ A water quality limited segment is any segment where it is known that water quality does not meet applicable water quality standards, or is not expected to meet applicable water quality standards, even after the application of the technology-based effluent limitations required by sections 301(b) and 306 of the federal Clean Water Act (40 CFR 130.2).

⁵ The department maintains current and past 303(d) lists and corresponding assessment worksheets online at: dnr.mo.gov/water/what-were-doing/water-planning/quality-standards-impaired-waters-total-maximum-daily-loads/impaired-waters.

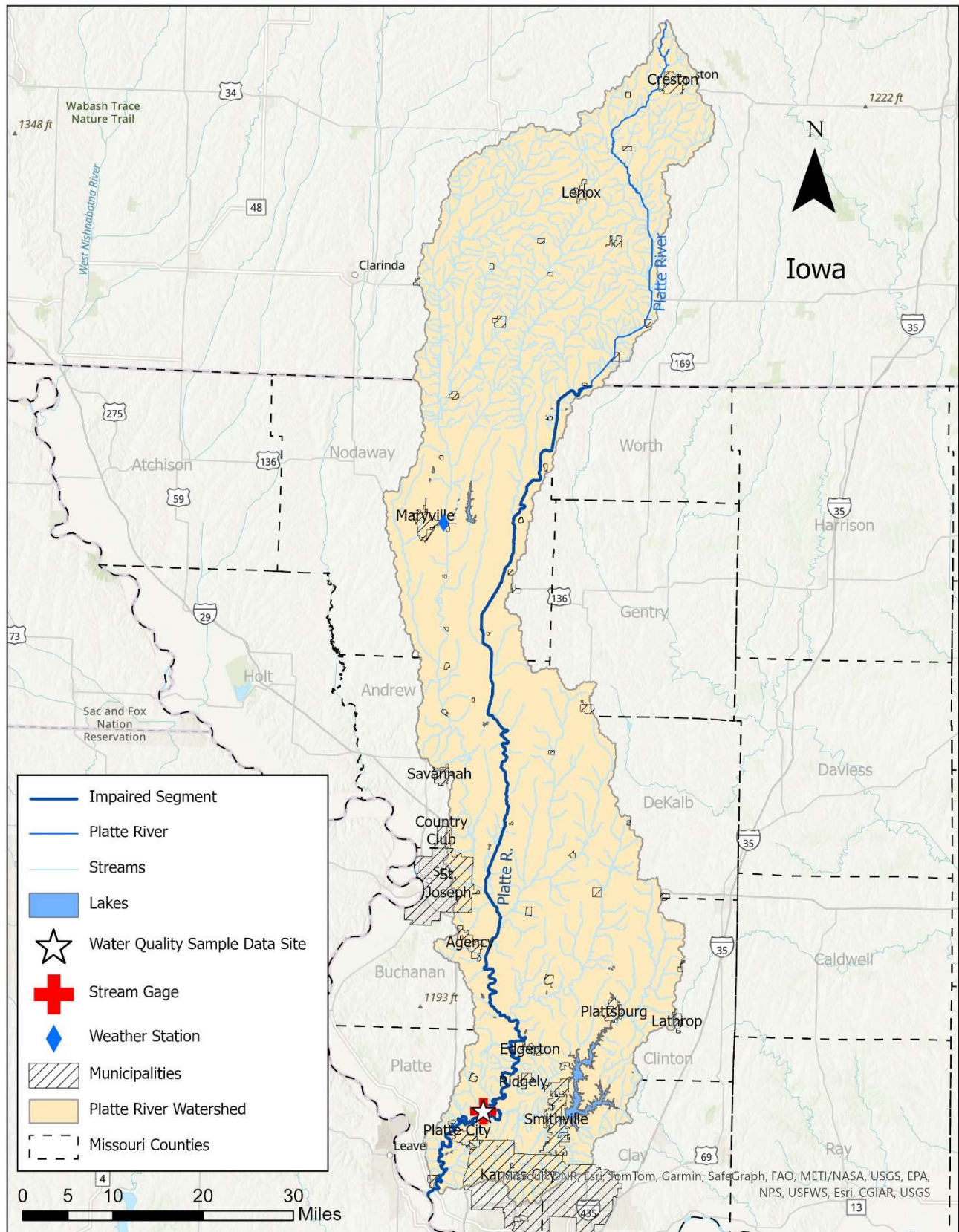


Figure 1. The Platte River watershed

2.1 Geology, Physiography, and Soils

The Platte River watershed is located within the Central Plains/Nishnabotna/Platte ecological drainage unit (EDU), which primarily consists of northwest Missouri and southwest Iowa (MoRAP 2005). Ecological drainage units are groups of watersheds that have similar biota, geography, and climate characteristics (Anderson et al. 1999).

The Platte River watershed is also located in the Rolling Loess Prairies EPA Level IV ecoregion. Ecoregion is defined in Missouri's Water Quality Standards at 10 CSR 20-7.031(1)(H) as "...areas of general similarity in ecosystems and in the type, quality, and quantity of environmental resources. They are designed to serve as a spatial framework for the research, assessment, management, and monitoring of ecosystems and ecosystem components. By recognizing spatial differences in the capacities and potentials of ecosystems, ecoregions stratify the environment by its probable response to disturbance." The Rolling Loess Prairies ecoregion is characterized by loess deposits on well drained plains and open low hills. Loess deposits are generally less than 25 feet in depth except along the Missouri River where deposits are thicker. Natural vegetation consists of tallgrass prairie and areas of oak-hickory forest, although cropland agriculture is widespread (Chapman et al. 2002).

Soils are categorized into hydrologic soil groups based on similar runoff potentials. Each hydrologic soil group indicates the rate at which water enters the soil profile under conditions of a bare, thoroughly wetted soil surface (NRCS 2009). This infiltration rate determines the quantity of precipitation that flows over land to water bodies as direct runoff. Group A soils have the highest rate of infiltration and the lowest runoff potential. Group D soils have the lowest rate of infiltration and highest runoff potential. Many wet soils fall into dual soil groups (e.g., Group C/D) due to the presence of a seasonal high-water table that results in saturation to the soil surface. Dual hydrologic soil groups account for this condition by providing both the drained and undrained condition of the soil.⁶ It should be noted that soil runoff potential is only one factor that determines the volume of runoff in a watershed. Impervious surfaces, vegetative cover, slope, rainfall intensity, and land use can significantly influence the potential for runoff regardless of the characteristics of the underlying soil. Figure 2 shows the distribution of hydrologic soil groups in the Platte River watershed. Table 1 provides a summary of the hydrologic soil groups in the Missouri portion of the watershed by area in square miles and relative percent.

⁶ For the purpose of hydrologic soil group, adequately drained means that the seasonal high water table is kept at least 24 inches (60 centimeters) below the surface in a soil where it would be higher in a natural state (NRCS 2009).

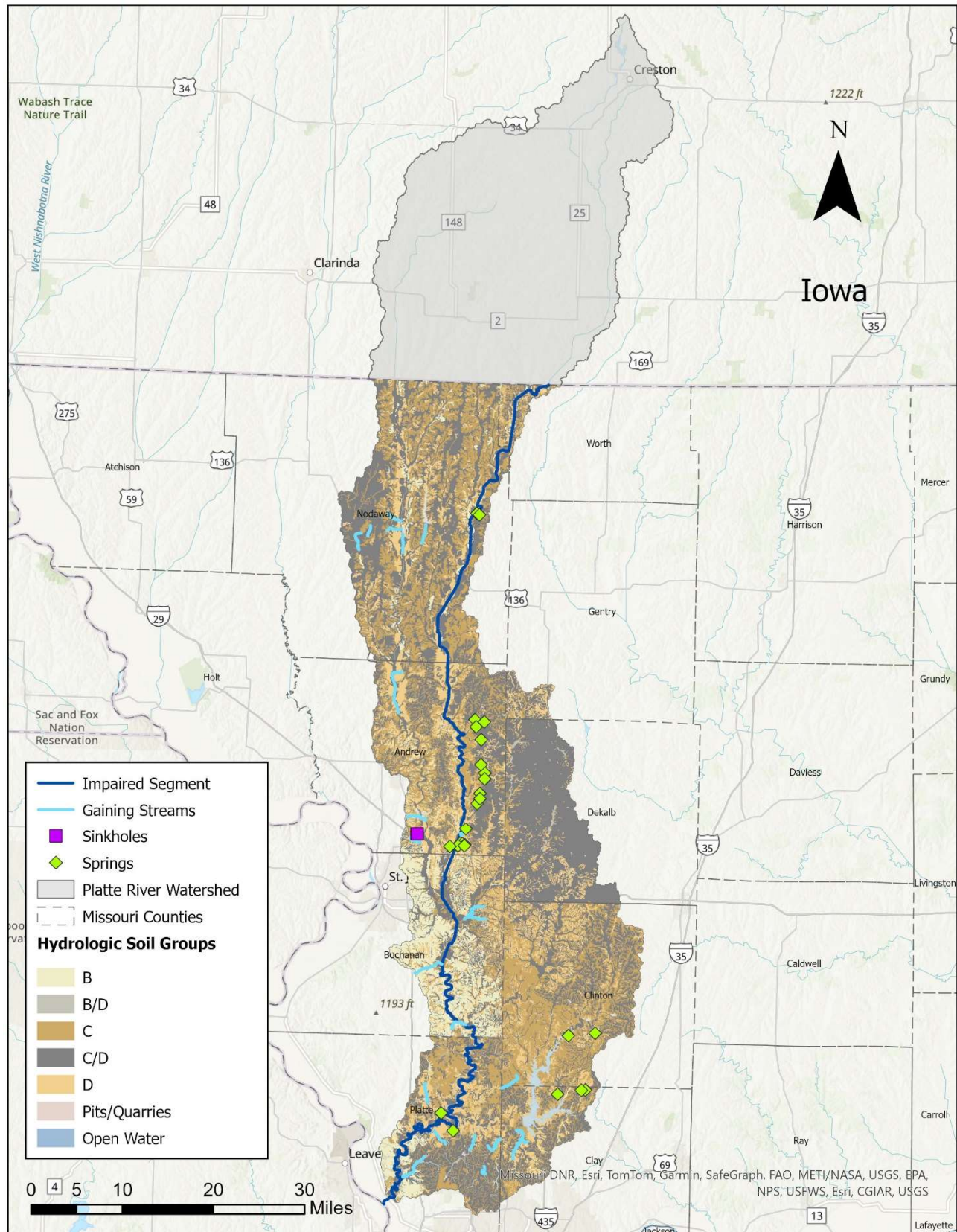


Figure 2. Hydrologic soil groups in the Platte River watershed in Missouri

Table 1. Hydrologic soil groups in the Platte River watershed in Missouri (NRCS 2020)

Hydrologic Soil Group	Area in the Watershed	
	Square miles	Percent
Group A	0.00	0.00%
Group B	127.72	7.72%
Dual Group B/D	10.76	0.65%
Group C	473.03	28.60%
Dual Group C/D	751.25	45.43%
Group D	271.13	16.40%
Open Water	17.57	1.06%
Pits/Quarries	2.33	0.14%
Totals	1,653.82*	100.00%

*Due to rounding and data resolution, this value differs slightly from the calculated watershed area presented in Section 2.

2.2 Climate

The most recent climate data from a weather station in close proximity to the Platte River watershed were measured at the National Centers for Environmental Information Maryville 2E Weather Station (USC00235340) in Nodaway County. The climate normals were developed based on temperature and precipitation data collected at that station between 1991 and 2020 (NOAA 2020). Precipitation normals are especially important because they relate to stream flow and runoff events that influence pollutant loading. This information is provided to illustrate general climate conditions in the watershed and was not used to derive the TMDL loading targets or allocations. Table 2 presents the 30-year monthly climate normals from the Maryville 2E Weather Station for precipitation and temperature. Figures 3 and 4 further summarize these data.

Table 2. 30-year monthly climate normals at the Maryville 2E, MO weather station

Month	Precipitation Total	Minimum Temperature	Maximum Temperature
	inches	°F	°F
January	0.89	13.9	33.8
February	1.20	17.9	38.9
March	2.31	28.9	51.5
April	3.98	39.2	63.2
May	5.47	51.5	73.3
June	4.97	61.6	83.0
July	5.33	65.6	86.7
August	4.22	62.9	85.2
September	3.52	53.7	78.4
October	3.01	41.3	66.1
November	1.98	29.2	50.7
December	1.49	19.2	38.5
	Total	Average	Average
	38.37	40.4	62.4

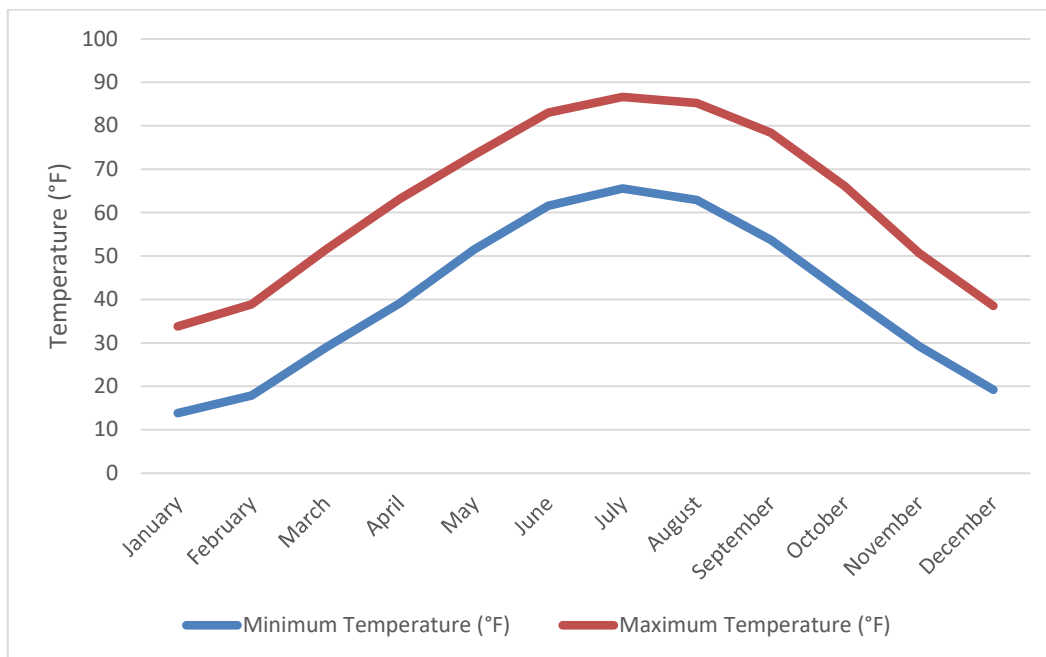


Figure 3. Monthly temperature normals at the Maryville 2E, MO weather station

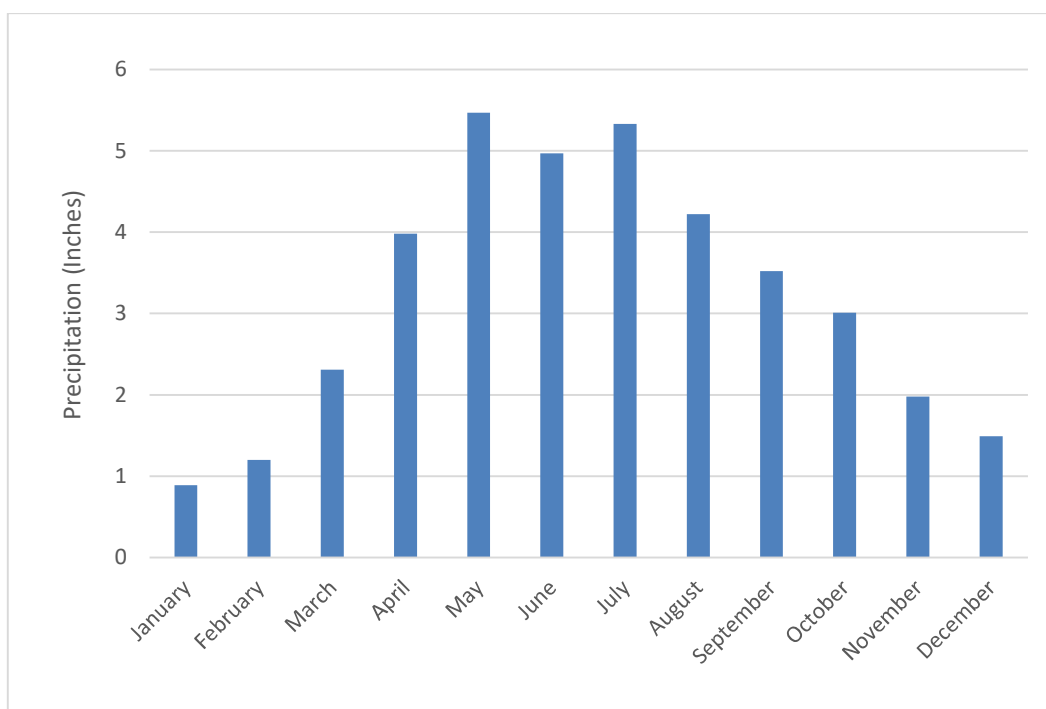


Figure 4. Monthly precipitation normals at the Maryville 2E, MO weather station

2.3 Population

State and county population estimates are available from the U.S. Census Bureau's 2020 census and can be localized using census block data (U.S. Census Bureau 2020a, U.S. Census Bureau 2020b). Population estimates for the Platte River watershed were derived using geographic information system (GIS) software by overlaying the watershed boundary over a map of census blocks (Figure

5). Wherever the centroid of a census block fell within the watershed boundary, the entire population of the census block was included in the total. If the centroid of the census block was outside the boundary, the population of the entire block was excluded. The municipal population was estimated using a similar method whereby municipal areas were overlain on the map of census blocks. The rural population was calculated as the difference between the municipal population and the total population. The population that lives in Missouri is fairly evenly divided with 46.5 percent residing in rural areas and 53.5 percent residing within municipal boundaries. As shown in Table 3, the Missouri population in the Platte River watershed increased by 18,423 people from 2000 to 2010 and the total population in the Platte River watershed increased by 7,440 people from 2010 to 2020. The total watershed population increase from 2010 to 2020 was a result of the increase in population on the Missouri side of the watershed, with a decrease in the Iowa population from 2010 to 2020 of 864 people.

Table 3. Population estimates for the Platte River watershed

Missouri Population Data								
Municipal			Rural			Total		
2000	2010	2020	2000	2010	2020	2000	2010	2020
56,818	69,598	78,780	27,850	33,493	32,615	84,668	103,091	111,395
Iowa Population Data								
Municipal			Rural			Total		
2000	2010	2020	2000	2010	2020	2000	2010	2020
--	11,960	11,761	--	3,862	3,197	--	15,822	14,958
Total Population Data								
Municipal			Rural			Total		
2000	2010	2020	2000	2010	2020	2000	2010	2020
--	81,558	90,541	--	37,355	35,812	--	118,913	126,353

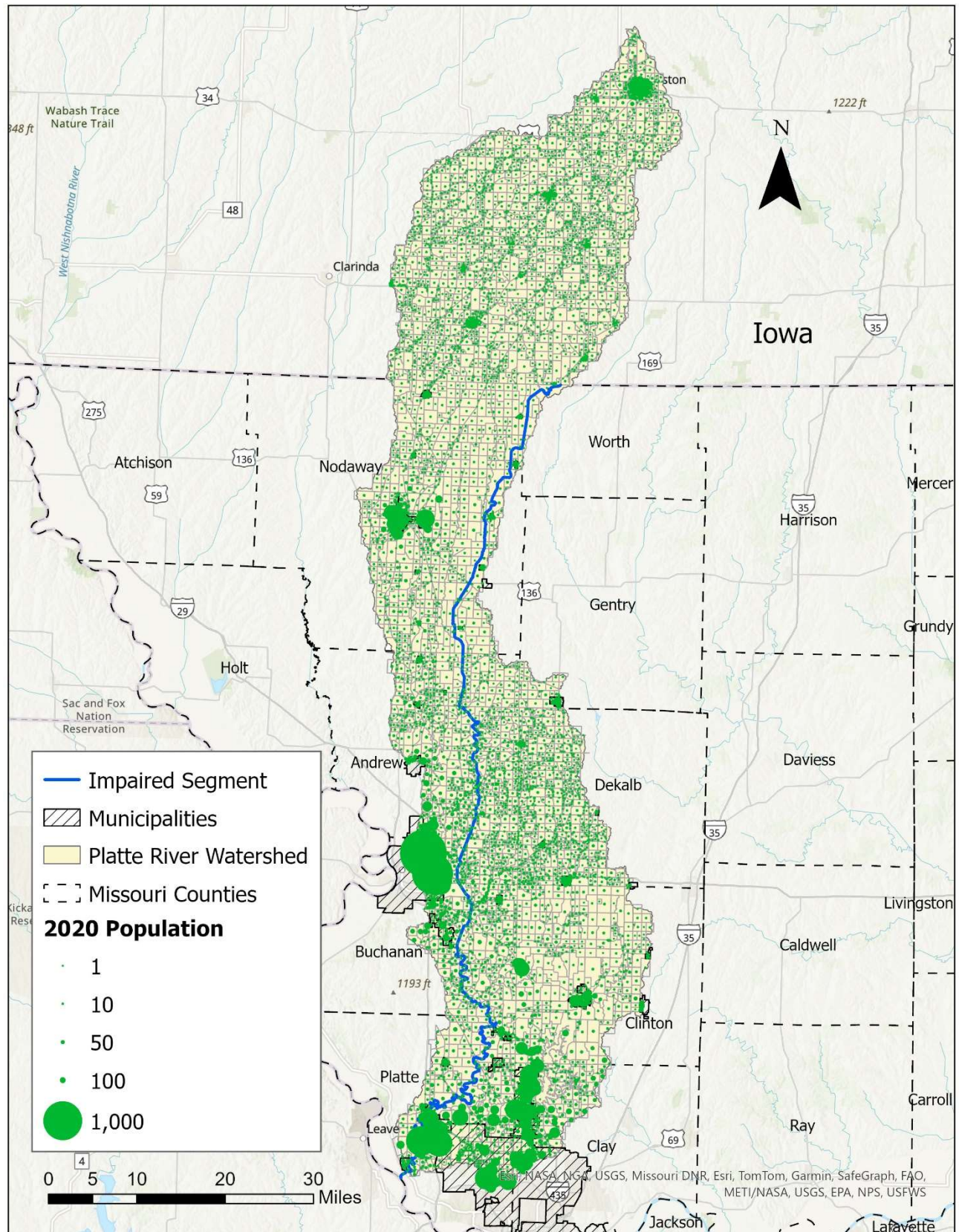


Figure 5. 2020 population in the Platte River watershed

2.4 Land Cover

A land cover analysis was completed using the 2019 National Land Cover Database published by the U.S. Geological Survey (USGS) (Dewitz 2019). Land cover types present in the Platte River watershed are summarized in Table 4. Figure 6 depicts the distribution of the land cover types throughout the watershed. Agricultural land uses account for approximately 78.75 percent of the total watershed area while developed areas account for 6.39 percent of watershed area.

Table 4. Land cover in the Platte River watershed

Land Cover Type	Total Watershed		Missouri Only	
	Area Square Miles	Percent	Area Square Miles	Percent
Developed, High Intensity	5.97	0.24%	5.40	0.33%
Developed, Medium Intensity	18.22	0.75%	15.42	0.93%
Developed, Low Intensity	60.69	2.49%	45.29	2.74%
Developed, Open Space	71.11	2.91%	52.70	3.19%
Barren Land	1.30	0.05%	1.21	0.07%
Cultivated Crops	1,199.56	49.15%	680.33	41.13%
Hay and Pasture	722.48	29.60%	563.79	34.09%
Shrub and Herbaceous	9.43	0.39%	5.26	0.32%
Forest	280.14	11.48%	222.96	13.48%
Wetlands	44.79	1.84%	38.05	2.30%
Open Water	27.06	1.11%	23.57	1.42%
Totals	2,440.74*	100.00%	1,653.97*	100.00%

*Due to rounding and data resolution, these values differ slightly from the calculated watershed area.

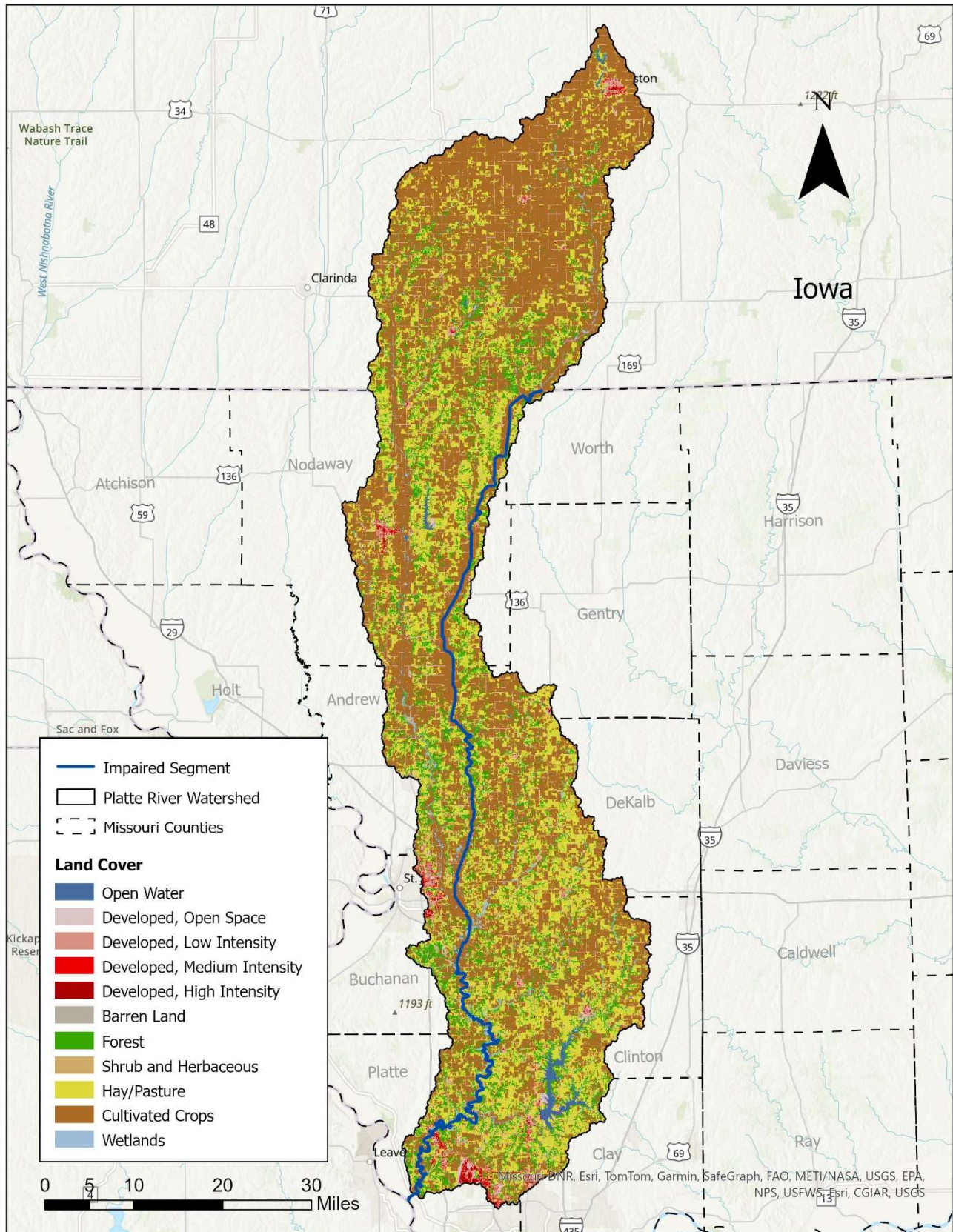


Figure 6. Land cover in the Platte River watershed

3. Applicable Water Quality Standards

TMDLs identify the maximum pollutant load that a water body can assimilate and still attain and maintain water quality standards. Water quality standards are therefore central to the TMDL development process. Under the federal Clean Water Act, every state must adopt water quality standards to protect, maintain, and restore the quality of the nation's surface waters (U.S. Code Title 33, Chapter 26, Subchapter III). Water quality standards consist of three major components: designated uses, water quality criteria, and an antidegradation policy. In accordance with federal regulations at 40 CFR 131.10, Missouri's Water Quality Standards for each individual water body also provide for the attainment and maintenance of water quality in any downstream waters. Revising existing water quality standards is not within the purview of TMDL development. If future water quality monitoring demonstrates that existing water quality standards are not protective of individual water bodies or downstream uses, new water quality standards can be proposed in accordance with the guidance provided in EPA's Water Quality Standards Handbook.⁷

3.1 Designated Uses

Missouri's Water Quality Standards at 10 CSR 20-7.031(1)(F) defines designated uses that are assigned to individual water bodies in accordance with 10 CSR 20-7.031(2) and are listed in 10 CSR 20-7.031, Table G (Lakes) and Table H (Streams). Missouri's Water Quality Standards designate the following uses to the Platte River:

- Irrigation
- Drinking Water Supply
- Livestock and wildlife protection
- Human health protection
- Warm water habitat (aquatic life)
- Whole body contact recreation category B
- Secondary contact recreation

The whole body contact recreation category B designated use of Platte River is impaired due to high *E. coli* bacteria concentrations. Whole body contact recreation includes activities that involve direct human contact with waters of the state to the point of complete body submergence (10 CFR 20-7.031(1)(F)2.A.). During whole body contact activities, such as swimming, accidental ingestion of the water may occur and there is direct contact to sensitive body organs, such as the eyes, ears, and nose. Whole body contact category A applies to waters that have been established by the property owner as public swimming areas and waters with documented existing whole body contact recreation uses by the public (10 CSR 20-7.031(1)(F)2.A.(I)). Category B applies to waters designated for whole body contact that are not contained within category A (10 CSR 20-7.031(1)(F)2.A.(II)). Secondary contact recreation, which includes activities such as boating, fishing, and wading, are activities that may result in contact with the water that is either incidental or accidental and the probability of ingesting appreciable quantities of water is minimal (10 CSR 20-7.031(1)(F)2.B.). The secondary contact recreation use is not impaired in the Platte River.

3.2 Water Quality Criteria

Water quality criteria represent a level of water quality that supports and protects particular designated uses. Water quality criteria are expressed as specific numeric criteria and as general

⁷ <https://www.epa.gov/wqs-tech/water-quality-standards-handbook>

narrative statements. Missouri's Water Quality Standards (10 CSR 20-7.031(4) and (5)) establish general criteria applicable to all waters of the state at all times and specific criteria applicable to waters contained in 10 CSR 20-7.031, Tables G and H. Specific numeric *E. coli* bacteria criteria are given in Missouri's Water Quality Standards at 10 CSR 20-7.031(5)(C) and Table A1. For whole body contact recreation category B waters, *E. coli* concentrations during the recreational season (April through October) shall not exceed the geometric mean of 206 colony forming units (cfu) per 100 milliliters (mL) of water. This criterion is also protective of the secondary contact recreational use.

3.3 Antidegradation Policy

Missouri's Water Quality Standards include the EPA "three-tiered" approach to antidegradation and may be found at 10 CSR 20-7.031(3).

- Tier 1 – Protects public health, existing instream water uses, and a level of water quality necessary to maintain and protect existing uses. Tier 1 provides the absolute floor of water quality for all waters of the United States. Existing instream water uses are those uses that were attained on or after November 28, 1975, the date of EPA's first water quality standards regulations related to existing uses.
- Tier 2 – Protects and maintains the existing level of water quality where it is better than applicable water quality criteria. Before water quality in Tier 2 waters can be lowered, there must be an antidegradation review consisting of: (1) a finding that it is necessary to accommodate important economic and social development in the area where the waters are located; (2) full satisfaction of all intergovernmental coordination and public participation provisions; and (3) assurance that the highest statutory and regulatory requirements for point sources and best management practices for nonpoint sources are achieved. Furthermore, water quality may not be lowered to less than the level necessary to fully protect the "fishable/swimmable" uses and other existing uses.
- Tier 3 – Protects the quality of outstanding national and state resource waters. Such waters are identified in 10 CSR 20-7.031 Tables D and E. There may be no new or increased discharges to these waters and no new or increased discharges to tributaries of these waters that would result in lower water quality.

Waters in which a pollutant is at, near, or exceeds the water quality criteria are considered in Tier 1 status for that pollutant. Therefore, the antidegradation goal for the Platte River is to restore water quality to levels that meet water quality standards.

4. Defining the Problem

E. coli are bacteria found in the intestines of humans and warm-blooded animals and are used as indicators of potential fecal contamination and risk of pathogen-induced illness to humans. In accordance with Missouri's 2022 Listing Methodology Document, the whole body contact recreation category B designated use for the Platte River is impaired because the geometric means of *E. coli* samples collected during the recreational season were greater than 206 cfu/100 mL in the most recent three years having available data with five or more samples.⁸ Sufficient data consistent with the

⁸ Listing Methodology documents are available online at <https://dnr.mo.gov/document-search/methodology-development-2022-section-303d-list-missouri>.

assessment methodology are available to support this listing as summarized in Table 5 and Figure 7. As shown, sufficient data for assessment were available in 2007 and 2019. *E. coli* concentrations exceeded the geometric mean of 206 cfu/100 mL during the recreational season in the Platte River in 2007 and 2019.

Individual *E. coli* measurements are provided in Appendix A, Table A-1, to illustrate the nature of the impairment, but were not used in the calculation of TMDL loading capacities or allocations. Individual measurements may be used to estimate pollutant reduction targets, to target implementation activities, and to select appropriate best management practices (BMPs). Estimated reduction targets for the Platte River are presented in a supplemental TMDL implementation strategies document available online at: dnr.mo.gov/water/what-were-doing/water-planning/quality-standards-impaired-waters-total-maximum-daily-loads/tmdls.

Table 5. Summary of available recreational season *E. coli* data for the Platte River⁹

Recreation Season	Number of Samples	Minimum (cfu/100 mL)	Maximum (cfu/100 mL)	Geometric Mean* (cfu/100 mL)
2007	5	120	1600	211
2008	3	510	2,600	1,032
2009	4	72	6,000	692
2010	4	320	1,600	643
2011	4	30	1,200	78
2012	4	74	1,700	244
2013	4	35	10,000	388
2014	4	420	6,400	1,765
2015	4	40	1,600	278
2016	4	310	7,900	1,686
2017	4	140	26,000	2,588
2018	4	35	6,800	608
2019	5	54	10,000	1,056
2020	4	90	15,000	1,612

* Although geometric means are presented for all years of available data, only years with a minimum of five samples were used for assessment purposes.

⁹ *E. coli* data may be reported in units of most probable number (MPN) or colony forming units (cfu) depending upon the analysis method used. Data reported as cfu is an actual count of bacteria colonies, whereas MPN is a statistical approximation. Although differences may exist, they are often used interchangeably. For simplicity, and to maintain consistency with Missouri Water Quality Standards, all *E. coli* data in this TMDL are presented in units of cfu regardless of the methodology used.

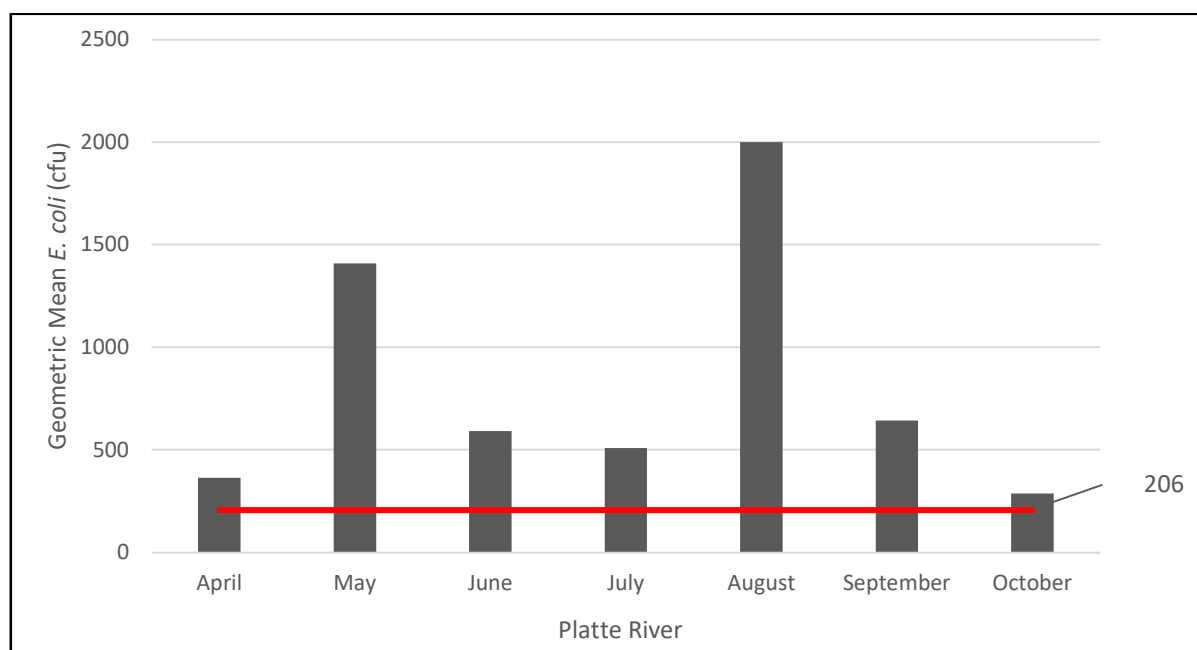


Figure 7. Geometric means for *E. coli* by month from 2007-2020

5. Source Inventory and Assessment

Point (typically regulated) and nonpoint (typically unregulated) sources may contribute to the elevated *E. coli* concentrations in Platte River. The following source inventory and assessment identifies and characterizes known, suspected, and potential sources of bacteria loading to the Platte River. Sources of bacteria loading are identified and quantified to the extent that information is available.

5.1 Point Sources

Point sources are defined by Section 644.016(16) of the Missouri Clean Water Law and are regulated pursuant to the National Pollutant Discharge Elimination System (NPDES) through the Missouri State Operating Permit program.¹⁰ A point source is defined as “any discernible, confined, and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, or vessel or other floating craft, from which pollutants are or may be discharged. Point source does not include agricultural stormwater discharges and return flows from irrigated agriculture.” Based on this definition, point sources include domestic wastewater treatment facilities or plants (WWTFs or WWTPs), industrial facilities, concentrated animal feeding operations (CAFOs), MS4s, and stormwater discharges from industrial areas and construction sites. Illicit straight pipe discharges are also point sources but are illegal and therefore unpermitted. Pollutant loading from point sources is typically most evident during low-flow conditions when stormwater influences are lower or nonexistent. In Iowa, point sources are regulated by the Iowa Department of Natural Resources and are presented in this document for informational purposes only. For purposes of this TMDL, in accordance with 40 CFR 131.10(b), it is assumed that all point sources in Iowa are regulated

¹⁰ The Missouri State Operating Permit program is Missouri’s program for administering the federal National Pollutant Discharge Elimination System (NPDES). Generally, the Clean Water Act requires all point sources that discharge pollutants to waters of the United States to obtain a NPDES permit. Issued and proposed operating permits are available online at: dnr.mo.gov/water/business-industry-other-entities/permits-certification-engineering-fees.

through permits that are protective of all downstream uses and that will meet Missouri water quality standards at the state border. The locations of permitted point sources in the Platte River watershed are presented in Figure 8.¹¹ Facility types and their expected contributions to the impaired stream are described individually in the following sections.

¹¹ Each marker on the map represents a facility. There may be multiple outfalls per facility.

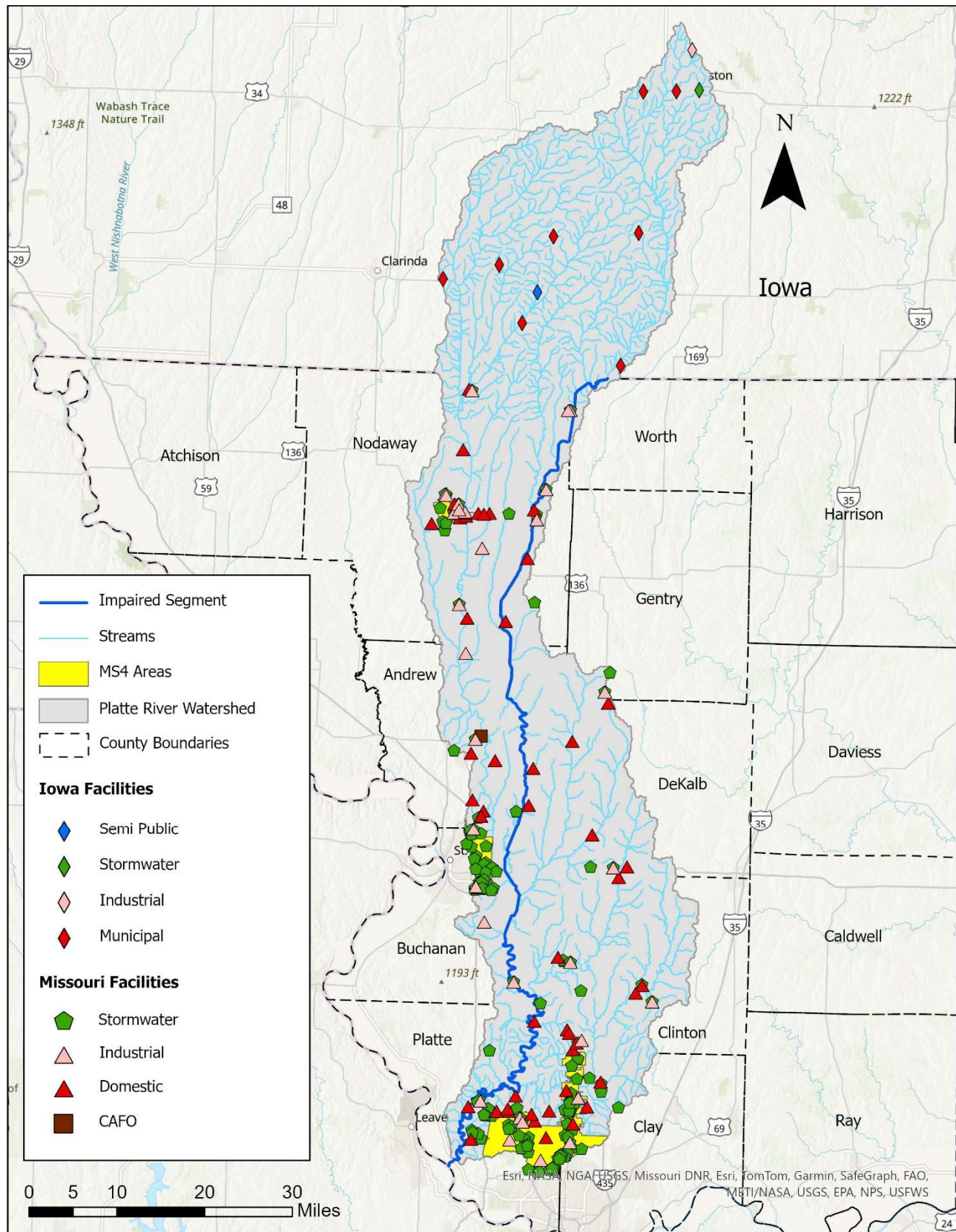


Figure 8. Permitted features and outfalls in the Platte River watershed

5.1.1 Domestic Wastewater Treatment Facilities

Domestic wastewater is primarily household waste, including graywater and sewage. Domestic wastewater treatment facilities or plants include both publicly owned (municipal and sewer districts) and privately owned facilities. Untreated or inadequately treated domestic wastewater discharges can be significant sources of bacteria to receiving waters (USEPA 1986). For this reason, domestic WWTFs are potential sources of *E. coli* loading to the Platte River. However, when operating as designed, facilities utilizing disinfection technologies discharge *E. coli* at very low concentrations and are not expected to cause or contribute to bacteria impairments through discharges of treated effluent. Facilities that use effluent for irrigation (land application) or otherwise do not directly discharge to streams during the recreational season are also not expected to cause or contribute to *E. coli* impairments when all permit conditions are met.

There are 48 domestic WWTFs in the Platte River watershed (Table 6). 10 CSR 20-7.015 requires recreational season *E. coli* limits for all domestic WWTFs within two miles upstream of waters with whole body contact designated uses. Facilities without disinfection can be potential sources of *E. coli* loading if not operated in a manner to mitigate significant *E. coli* loading during the recreational season. Facilities with disinfection generally do not contribute significant *E. coli* loading under normal operating conditions. Efforts to reduce facility loading to meet newly established wasteload allocations and to comply with applicable recreational criteria may include, but are not limited to, installation of disinfection infrastructure, effluent land application or irrigation, pump and haul operations, and seasonal batch discharging outside the recreational season. Some discharging lagoon systems do not discharge during extended dry conditions and are therefore less likely to cause or contribute to the impairment.

Table 6. Domestic wastewater treatment facilities in the Platte River watershed in Missouri¹²

Permit No.	Facility Name	Treatment Type	Design Flow (ft ³ /s)	Disinfection	Expires ¹³ (Year/Mo/Day)
MO0021458	Ravenwood WWTF	Lagoon	0.08	N	2024-12-31
MO0041190	Barnard WWTF	Lagoon	0.04	N	2028-05-31
MO0049662	King City Wastewater Lagoon	Lagoon	0.15	N	2025-06-30
MO0054755	Hopkins WWTF	Lagoon	0.19	Chlorination	2023-03-31
MO0080730	Shady Lawn Rest Home WWTF	Lagoon	0.02	N	2023-03-31
MO0096202	Union Star Sewage WWTF	Lagoon	0.11	N	2028-03-31
MO0104914	Conception Junction STL	Lagoon	0.05	N	2024-12-31
MO0108880	MAWC, Stewartsville WWTF	Lagoon	0.16	N	2024-09-30
MO0111236	Edgerton WWTF	Lagoon	0.12	Chlorination	2024-12-31

¹² As of August 2024

¹³ When a NPDES permit expires, the permittee remains bound by the conditions of that expired permit until either the permit is terminated or a new permit is issued.

Permit No.	Facility Name	Treatment Type	Design Flow (ft ³ /s)	Disinfection	Expires ¹³ (Year/Mo/Day)
MO0113751	MAWC, Trimble WWTF	Lagoon	0.14	N	2024-09-30
MO0117161	Clarksdale WWTF	Lagoon	0.06	N	2024-09-30
MO0120766	Camp Farwesta WWTF	Lagoon	0.03	N	2024-07-31
MO0139441	Lakewood Trails	Lagoon	0.02	N	2027-06-30
MOG823111	Smithville American Legion Post 58	Lagoon	0.001	N	2027-08-24
MO0126799	Bauman Park at Smithville Lake	Land Application	0.007	N	2024-12-31
MO0024961	KC Todd Creek WWTP	Mechanical Plant	5.26*	Ultraviolet	2026-09-30
MO0026298	Platte City WWTP	Mechanical Plant	3.09	Ultraviolet	2025-06-30
MO0030805	Plattsburg WWTP	Mechanical Plant	0.41	Ultraviolet	2024-09-30
MO0033286	Maryville WWTP	Mechanical Plant	3.09	Ultraviolet	2022-09-30
MO0044083	Clemstone WWTF	Mechanical Plant	0.05	Ultraviolet	2024-12-31
MO0048305	KC Rocky Branch WWTP	Mechanical Plant	4.33	Ultraviolet	2026-08-31
MO0055204	Smithville WWTP	Mechanical Plant	1.74	Ultraviolet	2025-06-30
MO0099287	Gower WWTP	Mechanical Plant	0.46	Ultraviolet	2024-12-31
MO0117447	MAWC, Centennial Acres WWTF	Mechanical Plant	0.01	N	2024-12-31
MO0119369	MDOC, Maryville Treatment Center WWTF	Mechanical Plant	0.10	Chlorination	2028-06-30
MO0119393	PCRS, Alan Acres WWTF	Mechanical Plant	0.02	Ultraviolet	2025-03-31
MO0123099	MAWC, Timber Springs Estates WWTF	Mechanical Plant	0.05	N	2024-12-31
MO0126705	Prairie Creek WWTP	Mechanical Plant	0.93*	Ultraviolet	2025-02-28
MO0137359	Faith Community Church WWTF	Mechanical Plant	0.01	Chlorination	2023-11-30
MOGDS0039	Indian Ridge Subdivision WWTP	Mechanical Plant	0.06	Chlorination	2029-06-30
MOGD00438	Timber Creek STP	Mechanical Plant	0.05	Ultraviolet	2024-06-30

Permit No.	Facility Name	Treatment Type	Design Flow (ft ³ /s)	Disinfection	Expires ¹³ (Year/Mo/Day)
MO0121843	Nick's Health Care Center, LLC	No Discharge	0.002	N	2020-12-31
MO0122432	PCRS D Red Rock WWTP	Sand/Rock Filter	0.02	Ultraviolet	2024-12-31
MO0127981	Scout Ridge Estates WWTF	Sand/Rock Filter	0.02	Chlorination	2028-03-31
MO0128074	PCRS D South Gale WWTP	Sand/Rock Filter	0.02	Ultraviolet	2024-09-30
MO0129194	Mozingo Lake Recreation Area	Sand/Rock Filter	0.02	N	2023-06-30
MO0129836	MAWC Clinton Estates WWTP	Sand/Rock Filter	0.11	N	2024-09-30
MO0130133	Pickering WWTF	Sand/Rock Filter	0.03	Chlorination	2028-05-31
MO0130826	Countryside View Subdivision WWTP	Sand/Rock Filter	0.01	Chlorination	2023-06-30
MO0131393	Pleasant View Addition WWTF	Sand/Rock Filter	0.02	N	2027-11-30
MO0133841	Cosby WWTP	Sand/Rock Filter	0.03	Ultraviolet	2024-09-30
MO0133876	Stoll Addition WWTF	Sand/Rock Filter	0.01	N	2027-11-30
MO0134295	Spring Meadows Subdivision WWTP	Sand/Rock Filter	0.01	Chlorination	2022-12-31
MO0134392	Millstone WWTF	Sand/Rock Filter	0.03	Chlorination	2023-03-31
MO0135810	Dawn Valley Subdivision WWTF	Sand/Rock Filter	0.02	Chlorination	2023-03-31
MO0137316	Village of Guilford WWTF	Sand/Rock Filter	0.02	N	2024-12-31
MO0128082	Highland Estates Subdivision WWTP	Sand/Rock Filter	0.02	N	2028-12-31
MO0109819	Basswood Resort WWTP	Trickling Filter	0.02*	Ultraviolet	2024-12-31

*Indicates the current design flow of a facility prior to a proposed facility upgrade currently approved by the department.

KC Todd Creek WWTP, Basswood Resort WWTP, and Prairie Creek WWTP, are currently in the process of expanding or upgrading the facilities, which will result in a higher design flow for the facility. The facilities have all undergone the Antidegradation Review process and been approved by the department.

All discharging facilities in Table 6 have operating permits containing final *E. coli* effluent limits and are expected to comply with such limits or be subject to department enforcement actions. Of the

48 domestic facilities in the Platte River watershed, ten are currently in a state of non-compliance (Table 7). The department's Clean Water Compliance and Enforcement section is currently overseeing these facilities' cases with the goal of returning the facilities back to compliance.

Table 7. Current domestic WWTFs in non-compliance in the Platte River watershed in Missouri¹⁴

Permit No.	Facility Name	Reason
MO0041190	Barnard WWTF	Violate effluent requirements, failure to upgrade facility, failure to comply with permit condition
MO0130826	Countryside View Subdivision WWTP	Caused pollution to waters of the state
MO0134295	Spring Meadows Subdivision WWTP	Caused pollution to waters of the state
MO0135810	Dawn Valley Subdivision WWTF	Caused pollution to waters of the state
MOGDS0039	Indian Ridge Subdivision WWTP	Caused pollution to waters of the state
MO0030805	Plattsburg WWTP	Failure to operate and maintain wastewater facilities
MO0044083	Clemstone WWTF	Failure to meet with a permit condition, failure to develop an operation and maintenance manual and failure to protect potable water
MO0109819	Basswood Resort WWTP	Caused pollution to waters of the state, violated effluent requirements, failure to comply with permit condition
MO0137359	Faith Community Church WWTF	Violated effluent limits, failed to submit DMRs, caused pollution to waters of the state
MOG823111	Smithville American Legion Post 58	Caused pollution to waters of the state, failure to renew or expired permit

Potential bacteria loading from domestic WWTFs may also occur from sanitary sewer overflows (SSOs). Sanitary sewer systems convey residential wastewater, and in some cases commercial and industrial wastewater, to the domestic WWTF. Sanitary sewer systems can handle limited amounts of inflow from stormwater and infiltration from groundwater but are typically not designed to collect large amounts of runoff from precipitation events. Overflows from sanitary sewer systems may result in elevated bacteria counts in nearby surface waters (USEPA 1996). Sanitary sewer overflows can be caused by high volume precipitation events and can also occur during dry weather due to blockages, line breaks, sewer defects, power failures, and vandalism. Sanitary sewer overflows can occur at any point in the collection system but are typically evident by overflowing manholes and backups into private residences. Such overflows may discharge directly to nearby waterways or may be restricted to terrestrial locations. These discharges are not authorized by the federal Clean Water Act or the Missouri Clean Water Law.

Sanitary sewer overflows are generally expected to be rare and temporary in nature. Missouri State Operating permits and 40 CFR Part 122.41(e) require permittees to properly operate and maintain their facility's collection systems. This is implemented through a special permit condition or schedule of compliance. Approximately 98 SSO events have been reported in the Platte River watershed since June 1, 2014. Municipalities with at least 12 SSOs in the last ten years include KC Todd Creek WWTP (MO0024961) with 16, Smithville WWTP (MO0055204) with 13, and Platte

¹⁴ Not all instances of non-compliance cause or contribute to the *E. coli* impairment

City WWTP (MO0026298) with 12. While these events can be potential sources of *E. coli*, not all events reach surface waters or are significant in discharge volume. Insufficient data are available to determine the significance of *E. coli* contributions from SSO events.

5.1.2 Industrial Facilities

Industrial facilities, shown in Table 8, discharge process wastewater used or generated during mining, manufacturing, or food processing activities, and may also include landfills. Mining and manufacturing facilities that do not generate *E. coli* are not expected to cause or contribute to bacteria impairments. Food processing wastewater may contain bacteria, however, there are no food processing facilities in the Platte River watershed.

There are five site-specific permitted industrial facilities in the Platte River watershed. Maryville Carbon Solution, LLC discharges stormwater to a tributary of One Hundred and Two River (WBID 342). St. Joseph Sanitary Landfill (MO0109878) discharges landfill stormwater to a tributary to Pigeon Creek (WBID 349). Purina Animal Nutrition LLC (MO0111511) discharges stormwater to the Tributary to Candy Creek (WBID 4048). Kansas City International Airport (MO0114812) discharges stormwater to a Tributary to Todd Creek (WBID 5043). AECI Nodaway Power Plant retains stormwater in a retention basin. In addition to these site-specific permits, there are 26 general permits for stormwater discharges from industrial facilities. None of these 31 facilities discharge wastewater from processes that actively generate *E. coli* and are not expected to be a significant contributor of *E. coli* loading to the Platte River.

Table 8. Industrial Facilities in the Platte River watershed in Missouri¹⁵

Permit No.	Facility Name	Permit Type	Expires (Year/Month/Day)
MO0136808	Maryville Carbon Solutions, LLC	Carbon Black	2027-09-30
MO0109878	St. Joseph Sanitary Landfill	Refuse Systems	2027-05-31
MO0111511	Purina Animal Nutrition, LLC	Prepared Feeds	2025-03-31
MO0114812	Kansas City International Airport	Airports, Flying Fields, and Services	2028-11-30
MO0122963	AECI Nodaway Power Plant	Electric Services	2028-08-31
MOG350070	MFA Bulk Plant Maryville	Petroleum Storage <250,000 Gallons	2027-09-17
MOG350072	MFA Bulk Plant Sheridan		2027-09-17
MOG350099	MFA Petro Card King City		2027-09-17
MOG350357	Consumers Oil Company		2027-09-17
MOG350362	Lawson's Quick Stop		2027-09-17
MOG350374	O Riley Oil		2027-09-17
MOG490001	Agency Quarry	Limestone Quarries	2027-04-30
MOG490004	Lathrop Quarry		2027-04-30
MOG490052	Gooden Quarry		2027-04-30
MOG490174	Martin Marietta Materials Stamper Quarry		2027-04-30
MOG490224	Barnard Quarry		2027-04-30
MOG490524	Keller Construction Company		2027-04-30

¹⁵ As of August 2024

Permit No.	Facility Name	Permit Type	Expires (Year/Month/Day)
MOG490581	Loch Sand and Construction Company	Limestone Quarries	2027-04-30
MOG490735	E and M Ready Mix Precast Inc		2027-04-30
MOG490819	Herzog Contracting Corp – Maryville		2022-04-30
MOG490901	Superior Bowen Asphalt Co KCI Plant		2027-04-30
MOG490918	Ozark Ready Mix Platte County		2027-04-30
MOG491580	Savannah Quarry Norris Quarries		2027-04-30
MOG640123	Smithville WTP	Water Treatment Plant Settling Basins	2024-02-24
MOG640142	Maryville Water Treatment Plant		2024-02-24
MOG640144	Ravenwood WTP		2024-02-24
MOG640179	Sheridan WTP		2024-02-24
MOG640184	Plattsburg Water Plant		2024-02-24
MOG640195	Bolckow WTP		2024-02-24
MOG690088	Tiffany Greens Golf Club	Dredging Lakes/River Harbors	2024-07-31
MOG970067	Main Street Drop Site	Yard Waste Compost Sites	2028-08-06

5.1.3 Concentrated Animal Feeding Operations

Animal waste generated from CAFOs can be a source of bacteria to water bodies (Rogers & Haines 2005). Pursuant to 10 CSR 20-6.300, permits are required for CAFOs that confine and feed or maintain more than 1,000 animal units for 45 days or more during any 12-month period.¹⁶ Permits may be required for facilities with fewer animal units if pollutants are discharged directly into waters of the state or other water quality issues are discovered. In Missouri, CAFOs operate under site-specific permits or one of two general permits (MO-G01 or MO-GS1). All CAFO facilities are permitted as no-discharge facilities. The MOGS1 permit does not authorize discharges for any reason. The MOG01 permit allows discharge only in the event of weather that exceeds the criteria of a catastrophic storm, and only authorizes discharge of the portion of the stormwater flow that exceeds the design storm event, which includes the direct precipitation and runoff from the 25-year, 24-hour storm event. These discharges are not expected to be significant contributors of *E. coli* to surface waters because they are rare and temporary in nature, and they may only occur during the defined catastrophic storm events that generally result in high flows that are infrequently met or exceeded.

¹⁶ As defined by 10 CSR 20-6.300(1)(B)2, an animal unit is a unit of measurement to compare various animal types at an animal feeding operation. One (1) animal unit equals the following: 1.0 beef cow or feeder, cow/calf pair, veal calf, or dairy heifer; 0.5 horse; 0.7 mature dairy cow; 2.5 swine weighing over 55 pounds; 10 swine weighing less than 55 pounds; 10 sheep, lamb, or meat and dairy goats; 30 chicken laying hens or broilers with a wet handling system; 82 chicken laying hens without a wet handling system; 55 turkeys in grow-out phase; 125 chicken broilers, chicken pullets, or turkey poults in brood phase without a wet handling system.

There is one, Class IC, CAFO present on the Missouri side of the Platte River watershed (Table 9).¹⁷ Animal waste applied on areas under the control of a CAFO are subject to conditions found in the permit, which include a requirement for the CAFO to develop a nutrient management plan. Section 640.760 Revised Statutes of Missouri (RSMo) establishes setback distances for surface application of liquefied manure from a CAFO by a third party.¹⁸ CAFOs violating their permit conditions as they relate to discharge or land application are potential sources of *E. coli* and may be subject to department enforcement action. When all permit requirements are met, CAFOs are not expected to be contributors of bacteria loading through direct discharge. Per Missouri Clean Water Law at 644.059 and 644.016(16) RSMo, and Missouri permit regulations at 10 CSR 20-6.300(1)(B)10, discharges of agricultural stormwater are separate from CAFO discharges and are considered nonpoint sources. Agricultural stormwater discharges are discussed in Section 5.2.1.

Table 9. Concentrated Animal Feeding Operations in the Platte River watershed in Missouri¹⁹

Permit No.	Facility Name	Permit Type	Expires (Year/Month/Day)
MOGS10521	Stone Ridge Pork, LLC	General CAFO IC	2028-02-13

5.1.4 Municipal Separate Storm Sewer Systems

Municipal separate storm sewer systems (MS4s) are stormwater conveyance systems owned by a public entity that are not part of a sanitary sewer system, a combined sewer system, or part of a domestic WWTF. Federal regulations issued in 1990 require that discharges from MS4s be regulated by permits if the population of a municipality, or in some cases a county, is 100,000 or more (Phase I). As of 1999, federal regulations require permits for discharges from small MS4s that are located within a United States Census Bureau defined urban area or are required to hold a MS4 permit based on other criteria by the permitting authority (Phase II). MS4 permits authorize the discharge of urban stormwater runoff. In general, urban runoff contains high levels of bacteria and may contribute to exceedances of *E. coli* criteria during and immediately after storm events in most streams throughout the county (USEPA 1983). Runoff contaminated with *E. coli* flows from open areas where soil erosion is common and from heavily paved areas (Burton & Pitt 2002). Common sources of *E. coli* contamination in urban stormwater have been documented as originating from birds, dogs, cats, and rodents (Burton & Pitt 2002). Irrigation runoff from residential lawns where pet wastes are present may also contribute *E. coli* loads to surface waters, as well as sanitary sewer overflows as discussed in Section 5.1.1. Regulated MS4s in the Platte River watershed are those maintained by the municipalities of Smithville, St. Joseph, Country Club, Maryville, and Kansas City (Figure 9 and Table 10). Additionally, the Missouri Department of Transportation (MoDOT) holds a statewide site-specific transportation separate storm sewer system (TS4) permit (MO0137910) that applies to stormwater discharges from MoDOT right-of-ways within the previously mentioned urban areas.

¹⁷ An operation's "class size" is a category that is based upon the total number of animal units confined at an operation. The Class IC, IB, and IA are categories that start at 1,000, 3,000, and 7,000 animal units respectively, all of which are required by state regulation to obtain a permit. (1,000 animal units is equal to 2,500 swine; 100,000 broilers; 700 dairy cows; or 1,000 beef steers).

¹⁸ Section 640.760 RSMo requires all third party applicators of liquefied manure from CAFOs to maintain the following minimum setback distances: 50 feet from a property boundary, 300 feet from any public drinking water lakes, 300 feet from any public drinking water well or intake structure, 100 feet from any perennial and intermittent streams without vegetation abutting such streams, and 35 feet from any perennial and intermittent streams with vegetation abutting such streams.

¹⁹ As of August 2024

Table 10. Municipal Separate Storm Sewer Systems in the Platte River watershed in Missouri²⁰

Permit No.	Facility Name	Permit Type	Expires (Year/Month/Day)
MOR04C037	Smithville Phase II MS4	Storm Water Small MS4	2026-09-30
MOR04C038	St Joseph Phase II MS4	Storm Water Small MS4	2026-09-30
MOR04C086	Country Club Phase II MS4	Storm Water Small MS4	2026-09-30
MOR04C089	Maryville Phase II MS4	Storm Water Small MS4	2026-09-30
MO0130516	Kansas City Phase I MS4	Storm Water Large MS4	2028-08-31

Although stormwater discharges are often untreated, MS4 and TS4 permit holders must develop, implement, and enforce stormwater management plans to reduce the contamination of stormwater runoff and prohibit illicit discharges. Stormwater management plans must include measurable goals, annual reports, and six minimum control measures. These control measures include public education and outreach, public participation and involvement, illicit discharge detection and elimination, construction site runoff control, post-construction runoff control, and pollution prevention. MS4 and TS4 permits may also require the development of supplemental TMDL Assumptions and Requirement Attainment Plans (ARAPs) where applicable. Missouri's list of regulated MS4s and associated stormwater management plans can be accessed at: <https://dnr.mo.gov/water/business-industry-other-entities/permits-certification-engineering-fees/stormwater/municipal-separate-storm-sewer-systems-ms4>.

Approximately 90.16 mi² (3.69 percent of the entire Platte River watershed or 5.45 percent of the Platte River watershed within Missouri) are contained within areas that may contribute stormwater runoff to regulated MS4s. Due to the relatively small proportion of area potentially contributing stormwater to these systems in the Platte River watershed, these MS4s are not expected to be a significant contributor to the *E. coli* impairment of the Platte River. Unregulated urban runoff from other developed areas in the Platte River watershed is considered a nonpoint source and is discussed in Section 5.2.2.

5.1.5 Stormwater Discharges

General stormwater (MOR) discharges based on the type of activity and are intended to be flexible enough to allow for ease and speed of issuance, but must also protect water quality. General stormwater permits are issued for activities similar enough to be covered by a single set of requirements. Table 11 lists stormwater discharge permits in the Platte River watershed. Permits associated with construction or land disturbance activities (MORA) are temporary. The number of permits of this type may vary in any given year. Despite this variation, activities associated with general construction or land disturbance permits are not expected to cause or contribute to *E. coli* impairments when all permit conditions are met.

Existing and future activities for which general stormwater permits are issued are expected to be conducted in compliance with all permit conditions including monitoring requirements and discharge limitations. Permit conditions are intended to protect the designated uses of all water bodies within the watershed. For the facilities identified in Table 11, activities conducted in accordance with these general stormwater permit requirements are not expected to contribute *E. coli*

²⁰ As of August 2024

loads in amounts substantial enough to cause or contribute to water quality excursions or surface water impairments. Per 10 CSR 20-6.010(13)(C), if at any time the department determines that a general permit is not providing adequate water quality protection, the department may require the owner or operator of a permitted site or activity to obtain a site-specific operating permit.

Table 11. Stormwater permitted facilities in the Platte River watershed in Missouri²¹

Permit No.	Facility Name	Permit Type	Expires (Year/Month/Day)
MOR130033	International Paper - St. Joseph	Textile and Apparel/Printing and Publishing	2028-10-22
MOR130097	Danisco USA Inc.		2028-10-22
MOR130108	The Hillshire Brands Company		2028-10-22
MOR203079	Nucor-LMP, Inc	Fabricating Metal, Light Industrial	2024-08-31
MOR203091	Laclede Chain Manufacturing Co.		2024-08-31
MOR203109	Altec Industries, Inc.		2024-08-31
MOR203111	Metal Culverts, Inc. - Maryville		2024-08-31
MOR203221	Bradken		2024-08-31
MOR203441	Clarios Pear St		2024-08-31
MOR203447	Gray Manufacturing Company Inc		2024-08-31
MOR203457	Kansas City Remanufacturing Services		2024-08-31
MOR203489	Easton Road Repair Shop		2024-08-31
MOR203513	DRiV		2024-08-31
MOR203556	Altec Industries Inc		2024-08-31
MOR22A368	Shamrock Timber Products Inc	Lumber and Wood Primary	2024-09-16
MOR23A085	Boehringer Ingelheim Animal Health-Cosby	Chemical Manufacturing	2025-10-31
MOR23A086	Boehringer Ingelheim Animal Health-Gene		2025-10-31
MOR23D183	Schutz Container Systems Inc	Plastics and Rubber Manufacturing	2027-05-09
MOR80C201	United Parcel Service UPS StJoseph MOSTJ	Motor Freight Transportation	2027-11-30
MOR80C555	Camp Branch Marina		2022-11-30
MOR80C556	Paradise Pointe Marina		2022-11-30
MOR80C642	The SYGMA Network Inc		2027-11-30
MOR80H155	Highway 136 Transfer Station	Solid Waste Transfer	2024-08-31

²¹ As of August 2024

Permit No.	Facility Name	Permit Type	Expires (Year/Month/Day)
MORA16411	Seven Bridges Phases 7A and 7B	Land Disturbance	2022-02-07
MORA19740	ONEOK 110 Platte River HDD Relocation		2027-02-07
MORA19931	Smithville Activity Center		2027-02-07
MORA20030	Project Velvet		2027-02-07
MORA20470	Cadence 1st Plat		2027-02-07
MORA20482	N Woodland Ave		2027-02-07
MORA20483	Platte Purchase Park Water and Sanitary		2027-02-07
MORA20484	Staley Hills 8th Plat		2027-02-07
MORA20516	Cadence 2nd Plat		2027-02-07
MORA20518	Cadence Villas 1st Plat		2027-02-07
MORA20631	Holly Farms 2nd Plat		2027-02-07
MORA20641	Congress Corporate Center		2027-02-07
MORA20712	Crow's Creek Lagoon Phase 2		2027-02-07
MORA20757	Calamar Senior Housing		2027-02-07
MORA20766	MFA Four Rivers Agronomy Center		2027-02-07
MORA20951	Vertical Enterprise		2027-02-07
MORA20981	N. Winan Road		2027-02-07
MORA21013	McBee's North Belt		2027-02-07
MORA21042	Cereal Ingredients Inc.		2027-02-07
MORA21071	Clarios		2027-02-07
MORA21080	Richardson Street Plaza		2027-02-07
MORA21167	Dave Gach - S169 Property		2027-02-07
MORA21220	Running Horse Subdivision		2027-02-07
MORA21227	Seven Bridges 8th Plat		2027-02-07
MORA21234	Amino Modot A05 Borrow Pit		2027-02-07
MORA21252	Cadence 3rd Plat		2027-02-07
MORA21253	Cadence Villas 2nd Plat		2027-02-07
MORA21326	KCI RV Storage		2027-02-07
MORA21328	Sprint Lumber, Inc		2027-02-07
MORA21359	Go Car Wash		2027-02-07
MORA21374	Golden Plains Transportation Improvement		2027-02-07

Permit No.	Facility Name	Permit Type	Expires (Year/Month/Day)
MORA21466	Genesis Place Third Plat Renew	Land Disturbance	2027-02-07
MORA21579	N Platte Purchase and 104th Street		2027-02-07
MORA21778	Cameron Pipeline		2027-02-07
MORA21794	Airport Chrysler		2027-02-07
MORA21826	Twin Creeks Cottages		2027-02-07
MORA21836	Retreat at Green Hills		2027-02-07
MORA21915	Herzog Gene Field Road		2027-02-07
MORA21980	McBee's Corner		2027-02-07
MORA21990	Go Car Wash		2027-02-07
MORA22395	ERD Commercial		2027-02-07
MORA22402	Greystone Subdivision Plat 10		2027-02-07
MORA22513	Nashua Elementary School		2027-02-07
MORA22633	Great Northwest Wholesale Water Commissi		2027-02-07
MORA22783	Windmill Creek		2027-02-07
MORA22894	Evergy Industrial Park to Lake Rd T-line		2027-02-07
MORA23167	Menards Self Storage		2027-02-07
MORA23197	Trimble Self-Storage		2027-02-07
MORA23198	Tiffany Springs Plaza Convenience Store		2027-02-07
MORA23232	Platte City Commerce Center		2027-02-07
MORA23356	South Main Corridor Improvement Phase 2		2027-02-07
MORA23358	701 N Woodbine Road Site Clearing		2027-02-07
MORA23419	Reed Collision Center		2027-02-07
MORA23455	North Village Hilton Hotel		2027-02-07
MORA23489	Line Creek Parkway Extension		2027-02-07
MORA23557	Altec West Lot		2027-02-07
MORA23626	Greyhawke 4th		2027-02-07
MORA23636	Woodhaven 1st Plat		2027-02-07
MORA23932	Northland Christian Athletic Field		2027-02-07
MORA24047	Smithville Campus		2027-02-07
MORA24062	Fairview Crossing North		2027-02-07

Permit No.	Facility Name	Permit Type	Expires (Year/Month/Day)
MORA24207	Attic Storage of Smithville	Land Disturbance	2027-02-07
MORA24208	HELENA TOWNHOMES AT TIFFANY SPRINGS		2027-02-07
MORA24209	Attic Storage of Smithville		2027-02-07
MORA24243	Chaves Development		2027-02-07
MORA24312	Missouri Western CTAC		2027-02-07
MORA24416	KCI 29 Logistics Park 1st Plat		2027-02-07
MORA24438	Smithville Self Storage		2027-02-07
MORA24453	Bridge St Bridge		2027-02-07
MORA24596	THE BRISTOL EAST		2027-02-07
MORA24664	I-29 and Mexico City Ave Interchange		2027-02-07
MORA24704	North Complex		2027-02-07
MORA24844	Southview Fields		2027-02-07
MORA24899	Route 169 Borrow		2027-02-07
MORA24902	North Village Plat 9		2027-02-07
MORA25010	First Park Third Plat		2027-02-07
MORA25204	Reed Collision Center		2027-02-07
MORA25262	Conception Wind Project		2027-02-07
MORA25368	Master's Transportation – KCI		2027-02-07
MORA25376	My Place Hotel		2027-02-07
MORA25476	St Joseph VA Clinic		2027-02-07
MORA25505	North Village Plat 10 Detention Basin		2027-02-07
MORA25513	Camden Point Wastewater Treatment Facility		2027-02-07
MORA25703	8407 State Route 92 Storage		2027-02-07
MORA25724	Champion Xpress Car Wash		2027-02-07
MORA25802	University Hills Development		2027-02-07
MORA25891	Nick's Healthcare		2027-02-07
MORA25940	Herzog Warehouse		2027-02-07
MORA26081	Park N Go PHASE 2		2027-02-07
MORA26101	Windmill Creek - DR Horton Lots		2027-02-07
MORA26135	Running Horse Village		2027-02-07

Permit No.	Facility Name	Permit Type	Expires (Year/Month/Day)
MORA26144	Fairview Crossing Townhomes	Land Disturbance	2027-02-07
MORA26159	Herzog Properties Grading		2027-02-07
MORA26161	Bluegrass Repower Project		2027-02-07
MORA26180	East Buchanan Middle School		2027-02-07
MORA26194	Tiffany Square		2027-02-07
MORA26207	East Buchanan Middle School		2027-02-07
MORA26364	Dollar General Store No. 30496		2027-02-07
MORA26375	QuikTrip Store No. 0288		2027-02-07
MORA26498	Huntley Disposal		2027-02-07
MORA26509	Kansas City Garage Storage, LLC		2027-02-07
MORA26511	Maryville High School		2027-02-07
MORA26564	OK Railroad Trail		2027-02-07
MORA26728	Platte County R3 Platte Purchase Trails		2027-02-07
MORA26811	PLATTE VALLEY PLAZA 15TH LOT 6LB		2027-02-07
MORA26822	Barmann Apartments		2027-02-07
MORA26856	KCI Logistics Park		2027-02-07
MORA26898	North Creek Village		2027-02-07
MORA26917	Platte City Commerce Center - Building C		2027-02-07
MORA26968	Rocky Branch Creek Data Center		2027-02-07

5.1.6 Illicit Straight Pipe Discharges

Illicit straight pipe discharges of domestic wastewater are also potential sources of bacteria. These types of sewage discharges bypass treatment systems, such as septic tanks or sanitary sewers, and discharge directly to a stream or an adjacent land area (Brown et al. 2004). Illicit straight pipe discharges are illegal and are not authorized by the federal Clean Water Act or the Missouri Clean Water Law. At present, there are no data about the presence or number of illicit straight pipe discharges in the Platte River watershed. For this reason, it is unknown to what significance straight pipe discharges contribute bacteria loads to surface waters in the watershed. Due to the illegal nature of these discharges, any identified illicit straight pipe discharges must be eliminated. In areas with a regulated MS4, illicit discharge detection and elimination is a required permit condition.

5.2 Nonpoint Sources

Nonpoint sources are diffuse sources with no discernible, confined, or discrete conveyance, and include all categories of discharge that do not meet the definition of a point source. Nonpoint

sources are not regulated by the federal Clean Water Act and are exempt from department permit requirements by state regulation 10 CSR 20-6.010(1)(B)1. Nonpoint source pollutants are typically transported by stormwater runoff, which is minor or negligible during dry weather conditions. Although there are no available *E. coli* data to indicate contributions from specific nonpoint sources, common nonpoint sources that have the potential to contribute bacteria loading to surface waters include runoff from agricultural lands, onsite wastewater treatment (septic) systems, and runoff from developed areas that do not have regulated storm sewer systems. Runoff from agricultural lands used for land application of wastewater or sludge from permitted facilities, including CAFOs, is also considered a nonpoint source, so long as the activities meet agricultural practices and agronomic land application rates, without direct discharge from land application activities. Nonpoint source pollution can also result from natural background contributions, such as wildlife waste. Streams with little to no riparian buffer are most susceptible to nonpoint source pollution. The department provides guidance and examples of BMPs to help reduce pollutant loading from nonpoint sources in the supplemental Platte River Nonpoint Source Implementation Strategies document at: <https://dnr.mo.gov/water/what-were-doing/water-planning/quality-standards-impaired-waters-total-maximum-daily-loads/tmdls>. These actions are voluntary and not a requirement of this TMDL; however, efforts to reduce pollutant loading from any potential nonpoint source contributor in the watershed is encouraged and will aid in meeting the water quality goals of this TMDL.

5.2.1 Agricultural Lands

Runoff from croplands, pasturelands, and low-density animal feeding operations is a potential source of bacteria to surface waters. Bacteria are transported in runoff from areas fertilized with animal manure and where livestock are present. Runoff can result from precipitation or excessive irrigation. Areas where nutrient management plans guide manure application and where BMPs are used to reduce soil erosion contribute less bacteria to surface waters than unmanaged areas. Soil and Water Conservation Districts provide funding and guidance for the development of nutrient management plans for unregulated private lands. Although grazing areas are typically well vegetated, livestock tend to congregate near feeding and watering areas, which can create barren areas that are susceptible to erosion (Sutton 1990). Additionally, livestock that are not excluded from streams will deposit manure and thus bacteria directly into the waterway.

As noted in Section 2.4 of this document, 41 percent of the watershed in Missouri is cropland and 34 percent is pastureland. Aside from livestock present in permitted CAFOs, the exact type and number of livestock present in the Platte River watershed is unknown. The number of cattle in each watershed can be estimated from county cattle population numbers provided in the U.S. Department of Agriculture's 2022 Census of Agriculture. Using the total number of cattle in Andrew, Buchanan, Clay, Clinton, DeKalb, Gentry, Nodaway, Platte, Worth Counties, and the proportion of each county's pastureland area in the watershed to the total pastureland area in each county, it is estimated that there are 71,262 cattle on the Missouri side of the Platte River watershed (NASS 2022). The United States Department of Agriculture estimates that a 1,000-pound beef cow produces approximately 64.1 pounds of manure per day (USDA 2014). Another study found that one gram of fresh manure from a cow on pasture contains a population of approximately 758,577 *E. coli* (Weaver et al. 2005).

Other types of livestock such as horses, sheep, goats, pigs, and poultry may also be contributing bacteria loads in the Platte River watershed. While the number and distribution of pigs and poultry in the watershed cannot be estimated from available data, an estimation of the total number of

cattle, horses, sheep, and goats is displayed in Table 12. Estimates for all livestock was calculated in the same manner as cattle, outlined above.

Table 12. Estimation of livestock in Platte River watershed per County

County	Cattle	Horses	Goats	Sheep
Andrew	8,079	249	554	239
Buchanan	5,542	345	172	260
Clay	4,079	211	248	85
Clinton	15,309	341	249	489
DeKalb	9,841	125	108	188
Gentry	1,113	18	33	38
Nodaway	20,191	367	1,028	1,592
Platte	6,346	235	155	270
Worth	762	9	8	9
Totals	71,262	1,901	2,554	3,169

5.2.2 Runoff from Developed Areas

Developed areas where stormwater discharges are not regulated through MS4 permits are nonpoint sources of *E. coli* loading. Sources of *E. coli* loading within such developed areas are similar to those previously described for in Section 5.1.4. As presented in Section 2.4, developed areas cover small portions of the total Platte River watershed. On the Missouri side of the watershed, low to high intensity development comprises approximately 4 percent and open space comprises approximately 3.19 percent. Degradation of water quality associated with imperviousness has been shown to first occur in a watershed at about 10 percent total imperviousness and to increase in severity as imperviousness increases (Arnold & Gibbons 1996; Schueler 1994). Due to the small amount of development in the watershed, runoff from developed areas is not expected to contribute substantial amounts of *E. coli* to the Platte River. If the developed areas are expanded in the future, BMPs and low impact development should be considered to mitigate pollutant loading from impervious surfaces.

5.2.3 Onsite Wastewater Treatment Systems

Onsite wastewater treatment systems treat and disperse domestic wastewater on the property where it is generated. When properly designed and maintained, these systems perform well and should not contribute substantial amounts of *E. coli* to surface waters. However, when these systems fail hydraulically (surface breakouts) or hydrogeologically (inadequate soil filtration), there can be adverse effects to surface water quality (Horsley & Witten 1996). Non-discharging systems of domestic wastewater having flows of 3,000 gallons per day or less may operate under a permit exemption as described in 10 CSR 20-6.010(1)(B)11 and 10 CSR 20-6.015(3)(B)6. These facilities should not discharge and are therefore not expected to contribute *E. coli* to surface waters. The Missouri Department of Health and Senior Services (DHSS) or local administrative authorities (commonly the local health department) have jurisdiction over onsite wastewater treatment systems with a design or actual flow of 3,000 gallons per day or less. Municipalities or counties may impose more stringent or additional requirements for owners of onsite systems. The Missouri Department of Health and Senior Services estimates that approximately 25 percent of homes in Missouri use

onsite wastewater treatment systems, particularly in rural areas where public sewer systems are not available (DHSS 2018). Failing onsite wastewater treatment systems can contribute *E. coli* to nearby streams under wet or dry weather conditions directly or through surface runoff and groundwater flows. Factors that may contribute to onsite wastewater treatment system failure include age, inadequate land area, poor soil for drainage, high water table, and inadequate maintenance. Proper maintenance of onsite wastewater treatment systems including septic tanks, associated drain fields, and household lagoons should minimize bacteria loading to surface waters.

The exact number of onsite wastewater treatment systems in the Platte River watershed is unknown. EPA's online input data server for the Pollutant Load Estimation Tool (PLET) provides estimates of septic system numbers by 12-digit HUC watershed based on 1992 and 1998 data from the National Environmental Service Center (USEPA 2023).²² These PLET derived estimates of septic system numbers are provided in Table 13. Based on this information, there are approximately 12,775 septic sewer systems in the entire watershed and 10,183 in the Missouri side of the watershed. Due to the increase in population since the 1990 census, actual septic system numbers may be greater.

Septic systems fail due to age and poor maintenance. A study by the Electric Power Research Institute suggests that in parts of Missouri, up to 50 percent of onsite wastewater treatment systems may be failing (EPRI 2000). Due to this high failure rate, onsite wastewater treatment systems are potential sources of bacteria loading to surface waters in Missouri. However, the significance of such contributions to the impairment of the Platte River is unknown. The greater the distance an onsite system is located from a surface water, the less likely it is to cause contamination (MU Extension 2023).

Table 13. PLET derived estimates of septic system numbers

Watershed Name	HUC12	Septic Systems	Population per Septic System
Agee Creek-Platte River	102400120302	111	3
Muddy Creek	102400120405	71	2
Bays Branch-Third Fork	102400120406	73	3
Prairie Creek	102400120902	359	2
Saylings Creek	102400120101	52	2
West Platte River-Platte River	102400120102	393	2
Clear Creek-Platte River	102400120301	65	3
Niagara Creek-Platte River	102400120303	162	3
Smith Fork-Little Platte River	102400120701	97	3
Town of Conception Junction-Platte River	102400120206	142	3
Headwaters Third Fork	102400120401	80	2
Pigeon Creek-Platte River	102400120602	242	2
Horse Fork	102400120702	75	3
Second Creek	102400120709	563	2
City of Blockton-Platte River	102400120110	88	2
Crooked Creek-Third Fork	102400120402	129	3

²² The National Environmental Services Center is located at West Virginia University and maintains a clearinghouse for information related to, among other things, onsite wastewater treatment systems. Available URL: www.nesc.wvu.edu/

Watershed Name	HUC12	Septic Systems	Population per Septic System
Belcher Branch-Platte River	102400120603	50	2
Turkey Creek-Platte River	102400120107	115	2
Headwaters Little Third Fork	102400120403	126	3
Little Third Fork	102400120404	185	3
Lower Castile Creek	102400120505	193	3
Grove Creek-Platte River	102400120802	125	2
East Branch Middle Platte River	102400120103	30	2
East Platte River	102400120104	34	2
Todd Branch-Platte River	102400120106	131	2
Upper Honey Creek	102400120201	65	2
Lower Honey Creek	102400120203	42	3
Old Channel-Platte River	102400120304	155	2
McGuire Branch	102400120502	41	3
Candy Creek-Platte River	102400120601	556	2
Grindstone Creek-Little Platte River	102400120703	170	3
Linn Branch-Smithville Lake	102400120704	70	3
Funkhouser Creek-Smithville Lake-Little Platte River	102400120705	186	3
Smithville Lake Dam-Little Platte River	102400120707	152	2
Wilkerson Creek	102400120708	280	2
Platte River	102400120903	313	2
Middle Platte River	102400120105	225	2
City of Maloy-Platte River	102400120108	71	2
Brushy Creek-Platte River	102400120204	163	2
Camp Branch-Smithville Lake	102400120706	120	2
Todd Creek	102400120710	521	2
Dicks Creek	102400120801	95	2
Jowler Creek-Lower Platte River	102400120901	189	2
Platte Branch	102400120109	104	2
Middle Honey Creek	102400120202	48	2
Long Branch	102400120205	90	3
Third Fork	102400120407	93	2
Upper Castile Creek	102400120501	226	3
Middle Castile Creek	102400120503	54	3
Malden Creek	102400120504	72	2
Little Platte River	102400120711	249	2
Lower East Fork One Hundred Two River	102400130104	257	2
Mozingo Creek	102400130303	75	3
Long Branch-One Hundred and Two River	102400130406	429	3
West Branch One Hundred Two River	102400130203	28	2
Headwaters West Fork One Hundred Two River	102400130204	147	2
Upper Neely Branch-One Hundred and Two River	102400130404	185	3
Kellog Branch-One Hundred and Two River	102400130405	302	3
Dog Branch-One Hundred and Two River	102400130403	170	3

Watershed Name	HUC12	Septic Systems	Population per Septic System
One Hundred and Two River	102400130407	1036	2
Middle East Fork One Hundred Two River	102400130102	91	2
West Fork One Hundred Two River	102400130205	92	2
Thill Branch-One Hundred and Two River	102400130304	522	3
Middle Fork One Hundred and Two River	102400130105	142	2
Headwaters West Branch One Hundred Two River	102400130202	154	2
Upper East Fork One Hundred Two River	102400130101	86	2
Headwaters Middle Fork One Hundred and Two River	102400130103	96	2
Middle Branch One Hundred and Two River	102400130201	192	2
Norvey Creek	102400130301	60	2
White Cloud Creek	102400130402	136	3
Beard Branch-One Hundred and Two River	102400130302	120	3
Headwaters White Cloud Creek	102400130401	414	3

5.2.4 Natural Background Contributions

Wildlife such as deer, waterfowl, raccoons, rodents, and other animals contribute to the natural background concentrations of *E. coli* that may be found in a water body. Such contributions may be a component of runoff from agricultural areas, developed areas, forest lands, and other areas. While typical wildlife populations are not expected to cause or contribute to water body impairments, animals that congregate in large groups on or near water bodies may contribute significant bacteria to surface waters. For instance, Canada geese have been found to contribute significant bacteria loads in some waters (Ishii et al. 2007). There are no watershed-specific population data for Canada geese or other waterfowl, but the Missouri Department of Conservation conducts statewide surveys in fall and winter. During 2023 - 2024, waterfowl counts ranged from approximately 136,408 in October 2023 to 1,181,040 in early January 2024 (MDC 2024a).

The exact number of deer in the watershed is also not known, but the Missouri Department of Conservation keeps harvest records by county for each hunting season. Harvest data provides a general idea of the number of deer that may be present in an area. The yearly harvests for the 2023 – 2024 season on the Missouri side of the Platte River watershed was approximately 1,115 in Andrew County, 890 in Buchanan County, 1,117 in Clay County, 889 in Clinton County, 1,058 in DeKalb County, 1,610 in Gentry County, 1,433 in Nodaway County, 1,209 in Platte County, and 1,175 in Worth County (MDC 2024b). Background concentrations of bacteria may also be present in benthic sediments and, if disturbed, can be resuspended as bacteria lives longer in the sediment than in water (Davis & Barr 2006; Marino & Gannon 1991). Resuspension has been found to occur during sediment disturbance and activities such as dredging, boating in shallow area, and swimming. The significance of any resuspended bacteria to the impairment in the Platte River is unknown. Natural background contributions are included in the nonpoint source load allocation.

5.2.5 Riparian Corridor Conditions

Riparian corridor conditions have a strong influence on instream water quality. Wooded riparian buffers are a vital functional component of stream ecosystems and are instrumental in the attenuation of pollutants in runoff. Land cover within 100 feet of streams in the Platte River watershed are presented in Table 14. Agricultural areas constitute approximately 55 percent of the

riparian corridors of streams in the Platte River watershed. These areas may be more susceptible to *E. coli* loading. Approximately 30 percent of the riparian corridors are forested. This indicates that some *E. coli* transported from adjacent lands into those areas may be intercepted before it enters the streams.

Table 14. Land cover in riparian corridors in the Platte River watershed

Land Cover Type	Total Watershed		Missouri Only	
	Area Square Miles	Percent	Area Square Miles	Percent
Developed, High Intensity	0.14	0.05%	0.13	0.06%
Developed, Medium Intensity	0.82	0.29%	0.73	0.36%
Developed, Low Intensity	4.30	1.54%	3.41	1.66%
Developed, Open Space	6.00	2.15%	4.82	2.34%
Barren Land	0.08	0.03%	0.07	0.04%
Cultivated Crops	86.18	30.89%	50.98	24.78%
Grassland and Pasture	67.40	24.16%	52.70	16.15%
Shrub and Herbaceous	0.91	0.33%	0.66	0.32%
Forest	83.19	29.82%	67.27	32.70%
Wetlands	19.96	7.16%	16.27	7.91%
Open Water	10.00	3.58%	8.69	4.22%
Totals	278.96	100%	205.75	100%

6. Calculating Loading Capacity

A TMDL is equal to the loading capacity of a water body for a specific pollutant, which is the maximum pollutant load that a water body can assimilate and still attain and maintain water quality standards. The loading capacity is derived from the numeric water quality criterion for each pollutant or an appropriate surrogate when no numeric criterion is applicable. Once the maximum allowable pollutant load is determined, a portion is assigned to point sources as a wasteload allocation and to nonpoint sources as a load allocation. The Clean Water Act at Section 303(d)(1)(C) and federal regulations at 40 CFR 130.7(c)(1) also require TMDLs to incorporate a margin of safety. The margin of safety accounts for uncertainties in scientific and technical understanding of water quality in natural systems and provides assurance that water quality standards will be achieved after all wasteload and load allocations are met. The loading capacity is equal to the sum of the wasteload allocation, load allocation, and the margin of safety as follows:

$$\text{TMDL} = \text{LC} = \sum \text{WLA} + \sum \text{LA} + \text{MOS}$$

where LC is the loading capacity, $\sum \text{WLA}$ is the sum of the wasteload allocations, $\sum \text{LA}$ is the sum of the load allocations, and MOS is the margin of safety.

7. Total Maximum Daily Loads

According to 40 CFR 130.2(i), TMDLs can be expressed in terms of mass per unit time, toxicity, or other appropriate measures. The TMDL for the Platte River is expressed as *E. coli* cfu per day using a load duration curve developed using the *E. coli* criterion concentration of 206 cfu/100 mL, all

possible stream flows (in cubic feet per second), and a unit conversion factor.²³ Establishing TMDLs using load duration curves is consistent with the Anacostia Ruling (*Friends of the Earth, Inc., et al v. EPA*, No 05-5010, April 25, 2006) and EPA guidance in response to that ruling (USEPA 2006; USEPA 2007a).

The selected TMDL target is protective of whole body contact category B and secondary contact recreational uses. The resulting load duration curve provides a visual representation of the pollutant loading capacity of the water body at all stream flows. The TMDL is applicable during the recreational season when the *E. coli* criterion applies. Using this approach, the available loading capacity of the stream varies with flow, but the pollutant concentration remains constant. Although TMDLs are expressed as daily mass loads, Missouri's *E. coli* criteria are expressed as geometric mean concentrations. Therefore, fluctuations in instantaneous concentrations are expected and individual bacteria measurements greater than the applicable criterion do not necessarily indicate a violation of water quality standards. Additional discussion about the methods used to develop the load duration curve for the Platte River is provided in Appendix B.

Observed data are plotted on the load duration curve graph to illustrate the frequency and magnitude of exceedance. Points above the curve exceed the loading capacity and points on or below the curve are in compliance with water quality standards. The load duration curve also helps to identify and differentiate between storm-driven loading and the presence of continuous loading. Storm-driven loading is expected under wet conditions when precipitation and runoff are high. Continuous loading is evident at low flows when point source discharges have greater influence on water quality. Load reductions needed to meet the *E. coli* criterion can be estimated using the geometric means of observed data within each flow percentile range and are provided in the supplemental Implementation Strategies document located at: <https://dnr.mo.gov/water/what-were-doing/water-planning/quality-standards-impaired-waters-total-maximum-daily-loads/tmdls>.

The *E. coli* load duration curve for the Platte River is displayed in Figure 9. The y-axis quantifies the *E. coli* mass load in cfu per day at the flow conditions (percentage of time a particular flow is equaled or exceeded) on the x-axis. Lower flows are equaled or exceeded more frequently than higher flows (greater than 90 percent of the time). The flow ranges presented are consistent with EPA guidance for using load duration curves to develop TMDLs (USEPA 2007b).

The TMDL for the Platte River and associated allocations at selected percentile flow exceedances are displayed in Tables 15 and 16. Due to the extremely large numbers associated with bacteria loads, *E. coli* values are presented using scientific notation. Specific allocations for individual sources are discussed in Sections 8 and 9.

²³ $Load \left(\frac{\text{count}}{\text{time}} \right) = Concentration \left(\frac{\text{count}}{\text{volume}} \right) * Flow \left(\frac{\text{volume}}{\text{time}} \right) * conversion\ factor \ (24,465,715)$

Table 15. *E. coli* TMDL and allocations for the Platte River at selected flows

Percent of time flow is equaled or exceeded	Flow ft ³ /s	LC (cfu/day)	Facilities WLA (cfu/day)	MS4 WLA* (cfu/day)	ΣLA* (cfu/day)	MOS (cfu/day)
95	67.04	3.38E+11	1.19E+11	1.25E+10	1.73E+11	3.38E+10
75	248.62	1.25E+12	1.19E+11	4.63E+10	9.63E+11	1.25E+11
50	618.23	3.12E+12	1.19E+11	1.15E+11	2.57E+12	3.12E+11
25	1,686.06	8.50E+12	1.19E+11	3.14E+11	7.22E+12	8.50E+11
5	8,023.81	4.04E+13	1.19E+11	1.49E+12	3.48E+13	4.04E+12

* Due to rounding and the limited number of decimal places displayed, summation of the allocation values displayed may not exactly match the presented load capacity in all cases.

Table 16. *E. coli* TMDL and allocations for the Missouri portion of the Platte River at selected flows

Percent of time flow is equaled or exceeded	Flow ft ³ /s	LC (cfu/day)	Facilities WLA (cfu/day)	MS4 WLA* (cfu/day)	ΣLA* (cfu/day)	MOS (cfu/day)
95	45.44	2.29E+11	1.19E+11	1.84E+10	6.89E+10	2.29E+10
75	168.51	8.49E+11	1.19E+11	6.83E+10	5.77E+11	8.49E+10
50	419.02	2.11E+12	1.19E+11	1.70E+11	1.61E+12	2.11E+11
25	1,142.77	5.76E+12	1.19E+11	4.63E+11	4.60E+12	5.76E+11
5	5,438.34	2.74E+13	1.19E+11	2.20E+12	2.23E+13	2.74E+12

* Due to rounding and the limited number of decimal places displayed, summation of the allocation values displayed may not exactly match the presented load capacity in all cases.

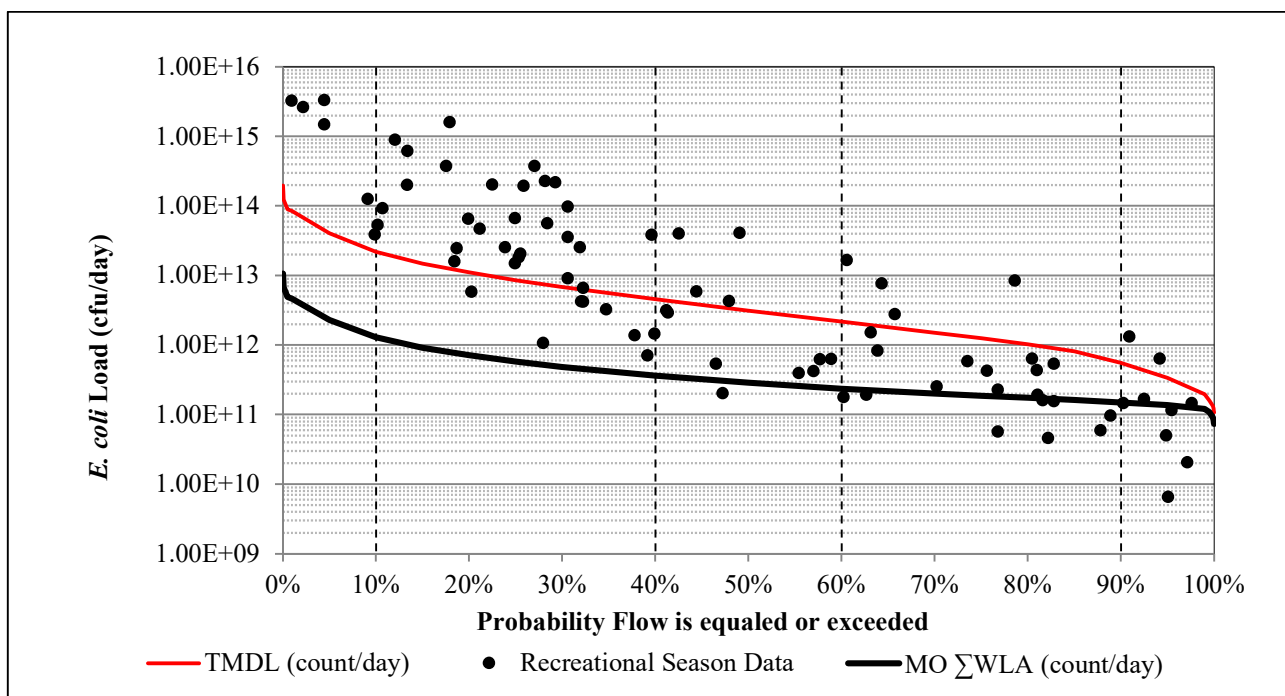


Figure 9. *E. coli* TMDL for the Platte River (WBID 312)

8. Wasteload Allocation (Point Source Load)

The wasteload allocation is the portion of the loading capacity assigned to existing or future point sources. Pursuant to 40 CFR 122.44(d)(1)(vii)(B), effluent limits or other permit conditions must be consistent with the assumptions and requirements of TMDL wasteload allocations. Missouri cannot impose TMDL wasteload allocations onto another state, therefore, wasteload allocation targets are calculated only for Missouri permitted facilities. In order to achieve Missouri water quality standards through the loading targets established by this TMDL, it must be assumed, in accordance with federal regulation 40 CFR 131.10(b), that any point source pollutant contributions from Iowa will be limited to ensure Missouri's water quality standards will be met at the state line. The Iowa *E. coli* criterion concentration for the Platte River is 126 cfu/100mL and is more stringent than the Missouri criterion concentration of 206 cfu/100 mL (IDNR 2024).

The wasteload allocations presented in this TMDL report do not preclude the establishment of future point sources. Any future point sources should be evaluated against the TMDL, the range of flows with which any additional bacterial loading will affect, and any additional requirements associated with antidegradation. Federal regulation 40 CFR 122.4(a), disallows the issuance of a NPDES permit if the conditions of the permit cannot provide for compliance with the applicable requirements of or regulations promulgated under the federal Clean Water Act. Additionally, 40 CFR 122.4(i) states no permit may be issued to a new source or new discharger if the discharge from its construction or operation will cause or contribute to violation of water quality standards. After undergoing antidegradation review, any new facility that discharges wastewater containing *E. coli* should operate in a manner that will not result in loading greater than the established wasteload allocation. New facilities that generate *E. coli* but disinfect wastewater prior to discharge or implement other appropriate measures to eliminate *E. coli* from effluent during the recreational season (e.g., no discharge or batch discharge) will result in negligible bacteria loading and will not cause or contribute to the impairment, and will not result in loading above the established wasteload

allocation. Decommissioning of onsite wastewater treatment systems and connecting to sewerage systems for wastewater treatment will result in net pollutant reductions that are consistent with the goals of this TMDL. Due to localized health concerns associated with bacteria and whole body contact recreation, water quality trading cannot be used as a mechanism for complying with the wasteload allocations established in this TMDL.

8.1 Domestic Wastewater Treatment Facilities

The aggregated wasteload allocations for domestic wastewater dischargers in the Platte River watershed is 1.19E+11 *E. coli* cfu/day. These allocations are based on individual facility design flows and the *E. coli* concentration target applicable to protect whole body contact recreation in the Platte River (Table 17). Actual flows that are less than the design flows may result in bacteria loads less than the calculated wasteload allocations. The wasteload allocations in this TMDL report do not authorize any facility to discharge bacteria at concentrations that exceed water quality standards, but may accommodate additional facility loading due to population increases or expansions in service area. The wasteload allocations in this TMDL report are applicable at all flows during the recreational season and do not include loading that may result from SSOs. Sanitary sewer overflows are unpermitted discharges and are not authorized under the Clean Water Act. For this reason, SSOs in the Platte River watershed are assigned wasteload allocations of zero at all flows. A zero wasteload allocation indicates a need for 100 percent reduction from contributing sources and is the most stringent wasteload allocation that can be assigned.

Table 17. Wasteload allocations for domestic wastewater discharges

Permit Number	Facility Name	<i>E. coli</i> Concentrations (cfu/100 mL)	WLA (cfu/day)
MO0121843	Nick's Health Care Center, LLC	0 (not permitted to discharge to surface waters)	0.00E+00
MO0126799	Bauman Park at Smithville Lake		0.00E+00
MO0129194	Mozingo Lake Recreation Area		0.00E+00
MO0137316	Village of Guilford WWTF		0.00E+00
MOG823111	Smithville American Legion Post 58		0.00E+00
MO0133876	Stoll Addition WWTF	206	4.21E+07
MO0130826	Countryside View Subdivision WWTP		5.15E+07
MO0137359	Faith Community Church WWTF		6.00E+07
MO0080730	Shady Lawn Rest Home WWTF		7.31E+07
MO0117447	MAWC, Centennial Acres WWTF		7.50E+07
MO0134295	Spring Meadows Subdivision WWTP		7.50E+07
MO0135810	Dawn Valley Subdivision WWTF		7.86E+07
MO0131393	Pleasant View Addition WWTF		8.03E+07
MO0139441	Lakewood Trails		8.06E+07
MO0127981	Scout Ridge Estates WWTF		8.42E+07
MO0119393	PCRSD, Alan Acres WWTF		8.58E+07
MO0128082	Highland Estates Subdivision WWTP		9.36E+07
MO0128074	PCRSD South Gale WWTP		1.04E+08
MO0122432	PCRSD Red Rock WWTP		1.17E+08

Permit Number	Facility Name	<i>E. coli</i> Concentrations (cfu/100 mL)	WLA (cfu/day)
MO0134392	Millstone WWTF	206	1.30E+08
MO0130133	Pickering WWTF		1.36E+08
MO0120766	Camp Farwesta WWTF		1.40E+08
MO0133841	Cosby WWTP		1.56E+08
MO0041190	Barnard WWTF		2.03E+08
MO0044083	Clemstone WWTF		2.34E+08
MOGD00438	Timber Creek STP		2.34E+08
MO0123099	MAWC, Timber Springs Estates WWTF		2.53E+08
MO0109819	Basswood Resort WWTP		2.73E+08
MO0104914	Conception Junction STL		2.73E+08
MO0117161	Clarksdale WWTF		3.04E+08
MOGDS0039	Indian Ridge Subdivision WWTP		3.23E+08
MO0021458	Ravenwood WWTF		4.17E+08
MO0119369	MDOC, Maryville Treatment Center WWTF		5.15E+08
MO0096202	Union Star Sewage WWTF		5.46E+08
MO0129836	MAWC Clinton Estates WWTP		5.77E+08
MO0111236	Edgerton WWTF		5.82E+08
MO0113751	MAWC, Trimble WWTF		7.02E+08
MO0049662	King City Wastewater Lagoon		7.69E+08
MO0108880	MAWC, Stewartsville WWTF		8.16E+08
MO0054755	Hopkins WWTF		9.36E+08
MO0030805	Plattsburg WWTP		2.09E+09
MO0099287	Gower WWTP		2.34E+09
MO0126705	Prairie Creek WWTP		7.02E+09
MO0055204	Smithville WWTP		8.77E+09
MO0026298	Platte City WWTP		1.56E+10
MO0033286	Maryville WWTP		1.56E+10
MO0048305	KC Rocky Branch WWTP		2.18E+10
MO0024961	KC Todd Creek WWTP		3.59E+10
Total			1.19E+11

As previously mentioned, three facilities, KC Todd Creek WWTP, Basswood Resort WWTP, and Prairie Creek WWTP are currently in the process of expanding or upgrading their facilities. Their proposed design flows are displayed in Table 18. The wasteload allocations assigned in Table 17 are based on the proposed design flows of the facilities. Should these expansions not occur, the wasteload allocation assigned to the facility should be based on their current design flow and the difference in the wasteload allocation based on the proposed design flow and that of the current design flow would become a reserve capacity.

Table 18. Domestic facilities with proposed upgrades, corresponding design flows, and WLAs

Permit No.	Facility	Current Design Flow (ft ³ /s)	WLA based on Current Design Flow	Proposed Design Flow (ft ³ /s)	WLA based on Proposed Design Flow	Difference in WLA – Potential Reserve Capacity
MO0024961	KC Todd Creek WWTP	5.26	2.65E+10	7.12	3.59E+10	9.40E+09
MO0109819	Basswood Resort WWTP	0.02	1.16E+08	0.05	2.73E+08	1.57E+08
MO0126705	Prairie Creek WWTP	0.93	4.68E+09	1.39	7.02E+09	2.34E+09

8.2 Industrial Facilities

There are 31 facilities in the Platte River watershed, five of which are site specific, that hold permits for industrial processes (Section 5.1.2). These facilities do not actively generate *E. coli* and are not expected to contribute *E. coli* to the Platte River. For this reason, the wasteload allocation for these facilities is set at zero at all flows.

8.3 Concentrated Animal Feeding Operations

Concentrated Animal Feeding Operation facilities in the Platte River watershed are subject to permit conditions that do not allow discharge directly or during land application. For this reason, the *E. coli* wasteload allocations for CAFO facilities is zero at all flows. A wasteload allocation of zero is the most stringent allocation that can be assigned and indicates the need for 100 percent pollutant reduction from any contributing sources.

8.4 Municipal Separate Storm Sewer Systems

Potential load contributions for MS4s were calculated based on the relative area of the watershed contained within MS4 systems. Areas potentially draining to MS4s account for approximately 90.16 mi², which equates to 3.69 percent of the entire Platte River watershed or 5.45 percent of the Platte River watershed within Missouri. The aggregated wasteload allocation for MS4s varies with stream flow and was calculated by multiplying the total loading capacity for the Platte River watershed by the relative area within the watershed that contributes to a MS4 system. If the area contributing to the MS4s expands or additional MS4 permits are required for stormwater discharges from other developed areas in the future, then the appropriate proportion of the load allocation, as it relates to stormwater pollutant contributions, may be re-assigned as a wasteload allocation without revision to this TMDL. At extreme low flows (greater than 99 percent flow exceeded), there is not enough assimilative capacity to allocate a WLA to the MS4. At these extreme low flows, stormwater is not expected to be source of *E.coli*.

8.5 Stormwater Discharges

Activities associated with stormwater permits described in Section 5.1.5 are not typically expected to contribute *E. coli* to surface waters, and permit conditions are protective of the designated uses assigned to all water bodies in the watersheds. Activities for which these permits are issued are expected to be conducted in compliance with all permit conditions, including any land application, monitoring, stormwater pollution prevention plans, and discharge limitations. For these reasons, the

E. coli wasteload allocations for these facilities are set at zero at all flows. Future stormwater permitted activities that do not actively generate bacteria and that operate in full compliance with permit conditions are not expected to contribute bacteria loads above negligible levels and will not result in loading that exceeds the sum of the TMDL wasteload allocations.

8.6 Illicit Straight Pipe Discharges

Illicit straight pipe discharges are illegal and are not permitted under the federal Clean Water Act. For this reason, illicit straight pipe discharges are not allocated a portion of the available loading capacity and are assigned an *E. coli* wasteload allocation of zero. Any existing illicit straight pipe discharges must be eliminated, and future discharges of this type should be prevented. Illicit discharge detection and elimination is a required permit condition in areas having a regulated MS4.

9. Load Allocation (Nonpoint Source Load)

The load allocation is the portion of the loading capacity assigned to existing and future nonpoint sources and natural background contributions (40 CFR 130.2(g)). The load allocation for this TMDL is calculated as the remainder of the loading capacity after allocations to the wasteload allocation and the margin of safety, as presented in Section 7. The load allocations include contributions from agricultural lands, runoff from developed areas, and natural background contributions. No portion of the load allocations is assigned to onsite wastewater treatment systems because when they are properly maintained and operating as designed, they do not discharge *E. coli* directly to surface waters. For this TMDL, the load allocation also includes any point source and nonpoint source contributions originating from Iowa. With Iowa's *E. coli* criterion concentration for the Platte River of 126 cfu/100mL, it is assumed, in accordance with federal regulation 40 CFR 131.10(b), that point source contributions from Iowa will be limited to ensure Missouri water quality standards are met at the state line.

10. Margin of Safety

A margin of safety is required to account for uncertainties in scientific and technical understanding of water quality in natural systems (CWA Section 303(d)(1)(C) and 40 CFR 130.7(c)(1)). Based on EPA guidance (USEPA 2001), the margin of safety can be achieved through two approaches:

- Explicit - Reserve a portion of the loading capacity as a separate term in the TMDL.
- Implicit - Incorporate the margin of safety within the wasteload allocation and the load allocation calculations by making conservative assumptions in the analysis.

For this TMDL, both implicit and explicit margins of safety are used. Bacteria decay rates were not applied, and the direct recreational-season geometric mean concentration was applied as a target for estimating daily loading values as required by the federal Clean Water Act. Additionally, domestic WWTFs employing disinfection technologies operate to eliminate nearly all present pathogens rather than targeting a specific water quality criterion (target = 0 cfu/day). This results in pollutant loading much lower than assigned wasteload allocations. These conservative assumptions serve as implicit margins of safety and are applicable during all flow conditions. At flow conditions above extreme low flows (less than 99 percent flow exceedance) where there is sufficient assimilative capacity, an explicit margin of safety equal to 10 percent of the loading capacity is applied in addition to the previously mentioned implicit margins of safety. At extreme low flows (greater than or equal to 99 percent flow exceedance) only an implicit margin of safety is applied.

It should be noted that Missouri's recreational bacteria criteria, and targets used in this TMDL, do not differentiate between human and nonhuman sources of *E. coli*. Technical support materials published by EPA in 2024 and a quantitative microbial risk assessment published by EPA in 2010 note decreased risk of illness associated with recreational uses in waters where *E. coli* contamination occurs from nonhuman sources, such as livestock, manure, or wildlife (USEPA 2024 and USEPA 2010). In some instances, risks of illness from recreational exposure were described as being 20 to 30 times less in animal-impacted waters than human-impacted waters (USEPA 2010). Although conservative assumptions incorporated into water quality criteria are not implicit margins of safety as it pertains to TMDLs, such information lends support that TMDL targets will be greatly protective of recreational uses in largely forested or agriculturally dominated subwatersheds of the Platte River where human inputs are less likely or significantly less than animal sources.

Through the department's assessment methodologies and approach for development of this TMDL, effort was made to reduce overall uncertainty in the analyses. The majority of *E. coli* samples collected over the last ten years were analyzed using an enzyme-specific media (IDEXX/Colilert method). This method helps reduce variability, thus resulting in a more accurate and higher *E. coli* yield as compared to if conventional culture media are used. Additionally, when calculating the load duration curves and estimating individual stream flow duration, the department used verified measured flow data from USGS gage stations. Together these quality assured data were used to provide estimates of existing loading from which pollutant reduction targets can be derived.

Due to reduced uncertainty in the analysis and calculation of loading targets, along with the various implicit margins of safety outlined above, the department considers the approach used to calculate these TMDLs appropriately includes an adequate and sufficient margin of safety to fulfill the requirements of 40 CFR 130.7(c)(1). The use of an additional explicit margin of safety of 10 percent is intended to account for other unspecified and unquantified uncertainties or unknowns. Reserving a portion of the available loading capacity and not allocating it to either point or nonpoint sources only further ensures that water quality standards will be achieved when all wasteload and load allocations are achieved.

11. Seasonal Variation

Federal regulations at 40 CFR 130.7(c)(1) require that TMDLs take into consideration seasonal variation in applicable water quality standards. The load duration curves provide the *E. coli* loading capacities for the Platte River at all possible flow regimes using data collected during all seasons. The *E. coli* TMDLs are therefore protective of designated uses during critical conditions throughout the recreational season, including during high flows associated with intense rainfall events when bacteria loading is more likely.

12. Monitoring Plans

The department conducts water quality monitoring in impaired waters within a reasonable timeframe following the approval of TMDLs, completion of facility upgrades and permit compliance schedules, or the implementation of watershed BMPs. The department will also routinely examine any available quality-assured water quality data collected by other local, state, and federal entities in order to assess the effectiveness of TMDL implementation. In addition, certain quality-assured data collected by universities, municipalities, private companies, and volunteer groups may be used to assess water quality following TMDL implementation.

13. Reasonable Assurance

Section 303(d)(1)(C) of the federal Clean Water Act requires that TMDLs be established at a level necessary to implement applicable water quality standards. As part of the TMDL process, consideration must be given to the assurances that point and nonpoint source allocations will be achieved, and water quality standards attained. Where TMDLs are developed for waters impaired by point sources only, reasonable assurance is provided through the NPDES permitting program. Missouri state operating permits requiring effluent limits and monitoring provide reasonable assurance that instream water quality standards will be met.

Where a TMDL is developed for waters impaired by both point and nonpoint sources, point source wasteload allocations must be stringent enough so that in conjunction with the water body's other loadings (i.e., nonpoint sources) water quality standards are met. Reasonable assurance that nonpoint sources will meet their allocated amount is dependent upon the availability and implementation of nonpoint source pollutant reduction plans, controls, or BMPs within the watershed. If BMPs or other nonpoint source pollution controls allow for more stringent load allocations, then wasteload allocations can be less stringent. Thus, the TMDL process provides for nonpoint source control tradeoffs (40 CFR 130.2(i)). When a demonstration of nonpoint source reasonable assurance is developed for an impaired water body, additional pollutant allocations for point sources may be allowed provided water quality standards are still attained. If a demonstration of nonpoint source reasonable assurance does not exist, or it is determined that nonpoint source pollutant reduction plans, controls, or BMPs are not feasible, durable, or will not result in the required load reductions, then allocation of greater pollutant loading to point sources cannot occur.

A variety of grants and loans may be available to assist watershed stakeholders with developing and implementing watershed based plans, controls, and practices to meet the required wasteload and load allocations in the TMDL and demonstrate reasonable assurance. Information regarding potential funding sources, cost-share opportunities, and implementation actions that address nonpoint source loading in the Platte River watershed are provided in the supplemental TMDL Implementation Strategies document available online at:

dnr.mo.gov/water/what-were-doing/water-planning/quality-standards-impaired-waters-total-maximum-daily-loads/tmdls.

14. Public Participation

EPA regulations at 40 CFR 130.7 require that TMDLs be subject to public review. A 45-day public notice period for this TMDL report was scheduled from December 6, 2024, through January 20, 2025. Following a request for additional time for comment and minor changes to the TMDL, a second 45-day public notice period was scheduled from February 7, 2025, through March 24, 2025. Groups that directly received notice of the public comment period for this TMDL include, but are not limited to:

- Missouri Clean Water Commission;
- Iowa Department of Natural Resources;
- Missouri Department of Conservation;
- Mo-Kan Regional Planning Commission;
- Northwest Missouri Regional Planning Commission;
- Mid-America Regional Council;
- County Soil and Water Conservation Districts;

- County health departments;
- County commissions;
- University of Missouri Extension;
- Missouri Coalition for the Environment;
- Missouri Farm Bureau;
- Stream Teams United;
- Stream Team volunteers living in or near the watershed;
- Affected permitted entities; and
- Missouri state legislators representing areas within the watershed.

In addition to those groups directly contacted about the public notice, this TMDL report and an implementation strategies document are posted on the department's TMDL webpage at: dnr.mo.gov/water/what-were-doing/water-planning/quality-standards-impaired-waters-total-maximum-daily-loads/tmdls.

The department maintains an email distribution list for notifying subscribers of significant TMDL updates or activities, including public notices and comment periods. Those interested in subscribing to TMDL updates can submit their email address using the online form available at public.govdelivery.com/accounts/MOENR/subscriber/new?topic_id=MODNR_177.

15. Administrative Record and Supporting Documentation

The department has an administrative record on file for the Platte River *E. coli* TMDL. The record contains information on which the TMDL is based. It additionally includes the TMDL implementation strategies document, the public notice announcement, any public comments received, and the department's responses to those comments. This information is available upon request to the department at: dnr.mo.gov/open-records-sunshine-law-requests. The department will process any request for information about this TMDL in accordance with Missouri's Sunshine Law (Chapter 610, RSMo) and the department's administrative policies and procedures governing Sunshine Law requests.

16. References

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Appendix A

Table A-1. Available *E. coli* data for recreational season for the Platte River (312)

Year	Site Code	Site Name	<i>E. coli</i> (cfu/100mL)
2007	312/24.0	Platte R. @ Sharps Station	120.00
2007	312/24.0	Platte R. @ Sharps Station	1,600.00
2007	312/24.0	Platte R. @ Sharps Station	140.00
2007	312/24.0	Platte R. @ Sharps Station	130.00
2007	312/24.0	Platte R. @ Sharps Station	120.00
2008	312/24.0	Platte R. @ Sharps Station	510.00
2008	312/24.0	Platte R. @ Sharps Station	830.00
2008	312/24.0	Platte R. @ Sharps Station	2,600.00
2009	312/24.0	Platte R. @ Sharps Station	930.00
2009	312/24.0	Platte R. @ Sharps Station	6,000.00
2009	312/24.0	Platte R. @ Sharps Station	570.00
2009	312/24.0	Platte R. @ Sharps Station	72.00
2010	312/24.0	Platte R. @ Sharps Station	360.00
2010	312/24.0	Platte R. @ Sharps Station	930.00
2010	312/24.0	Platte R. @ Sharps Station	1,600.00
2010	312/24.0	Platte R. @ Sharps Station	320.00
2011	312/24.0	Platte R. @ Sharps Station	1,200.00
2011	312/24.0	Platte R. @ Sharps Station	32.00
2011	312/24.0	Platte R. @ Sharps Station	32.00
2011	312/24.0	Platte R. @ Sharps Station	30.00
2012	312/24.0	Platte R. @ Sharps Station	1,700.00
2012	312/24.0	Platte R. @ Sharps Station	80.00
2012	312/24.0	Platte R. @ Sharps Station	74.00
2012	312/24.0	Platte R. @ Sharps Station	350.00
2013	312/24.0	Platte R. @ Sharps Station	10,000.00
2013	312/24.0	Platte R. @ Sharps Station	35.00
2013	312/24.0	Platte R. @ Sharps Station	540.00
2013	312/24.0	Platte R. @ Sharps Station	120.00
2014	312/24.0	Platte R. @ Sharps Station	840.00
2014	312/24.0	Platte R. @ Sharps Station	6,400.00
2014	312/24.0	Platte R. @ Sharps Station	4,300.00
2014	312/24.0	Platte R. @ Sharps Station	420.00
2015	312/24.0	Platte R. @ Sharps Station	260.00
2015	312/24.0	Platte R. @ Sharps Station	360.00
2015	312/24.0	Platte R. @ Sharps Station	1,600.00
2015	312/24.0	Platte R. @ Sharps Station	40.00
2016	312/24.0	Platte R. @ Sharps Station	7,900.00
2016	312/24.0	Platte R. @ Sharps Station	1,100.00

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2016	312/24.0	Platte R. @ Sharps Station	3,000.00
2016	312/24.0	Platte R. @ Sharps Station	310.00
2017	312/24.0	Platte R. @ Sharps Station	140.00
2017	312/24.0	Platte R. @ Sharps Station	7,700.00
2017	312/24.0	Platte R. @ Sharps Station	1,600.00
2017	312/24.0	Platte R. @ Sharps Station	26,000.00
2018	312/24.0	Platte R. @ Sharps Station	6,400.00
2018	312/24.0	Platte R. @ Sharps Station	90.00
2018	312/24.0	Platte R. @ Sharps Station	6,800.00
2018	312/24.0	Platte R. @ Sharps Station	35.00
2019	312/24.0	Platte R. @ Sharps Station	1,100.00
2019	312/24.0	Platte R. @ Sharps Station	10,000.00
2019	312/24.0	Platte R. @ Sharps Station	54.00
2019	312/24.0	Platte R. @ Sharps Station	280.00
2019	312/24.0	Platte R. @ Sharps Station	7,900.00
2020	312/24.0	Platte R. @ Sharps Station	2,500.00
2020	312/24.0	Platte R. @ Sharps Station	15,000.00
2020	312/24.0	Platte R. @ Sharps Station	2,000.00
2020	312/24.0	Platte R. @ Sharps Station	90.00

Appendix B

Development of *E. coli* Load Duration Curves

Overview

A load duration curve was used to develop the *E. coli* TMDL for the Platte River. Load duration curves visually display the loading capacity of a water body at all possible flows based on historical flow data and the defined target concentration for each pollutant. For this TMDL, a portion of the *E. coli* loading capacity is assigned to a wasteload allocation based on the individual design flows of domestic WWTF present in the watershed and the relative watershed area that contributes to MS4s. Ten percent of the loading capacity is reserved as an explicit margin of safety except for the lowest one percent of flow conditions, where only an implicit margin of safety is applied. The remaining portion of the loading capacity is allocated to nonpoint sources.

Methodology

Load duration curves are based on flow duration curves developed using a long-term time series of daily flows and a numeric water quality target. Average daily flow data that are representative of the impaired segment are used to develop the flow duration curve. If sufficient flow records for the impaired stream segment are not available, then flow data collected from a gage in a representative watershed may be used, or a flow duration curve can be derived by synthesizing long-term flow data from several gages within the same ecological drainage unit.

For the Platte River watershed, flow estimates were area-corrected based on flows measured at USGS stream gage 06821190, located on the Platte River at Sharps Station from August 2003 to August 2023. Average daily flows were corrected based on the proportion of the area draining to the impaired water body segment. In addition to calculating the total daily flow of the impaired segment, the daily flow was calculated for each state using correction factors based on the proportion of the drainage area for Missouri and Iowa (Table B-1). Figure B-1 presents the flow duration curve developed for the impaired segment.

The loading capacity was derived using the applicable Missouri water quality criterion, which is less conservative than the Iowa water quality criterion. The loading capacity was calculated based on the Missouri whole body contact category B *E. coli* criterion concentration of 206 cfu/100 mL, average daily flows, and a conversion factor of 24,465,715 in order to generate the loading capacity in units of cfu/day.²⁴

Table B-1. Information used for developing area corrected flow records²⁵

Watershed	USGS 06821190 Platte River at Sharps Station, MO
Watershed Area (mi ²)	2,440.16
Gage Watershed Area (mi ²)	2,380.00
Gage Ratio	1.03
Iowa Watershed Area (mi ²)	786.28
Iowa Watershed Ratio	0.32

²⁴ $Load \left(\frac{\text{count}}{\text{day}} \right) = \left[Target \left(\frac{\text{count}}{100\text{ml}} \right) \right] * \left[Flow \left(\frac{\text{feet}^3}{s} \right) \right] * [Conversion Factor]$

²⁵ Flow data that were in provisional status at the time of this report were not used.

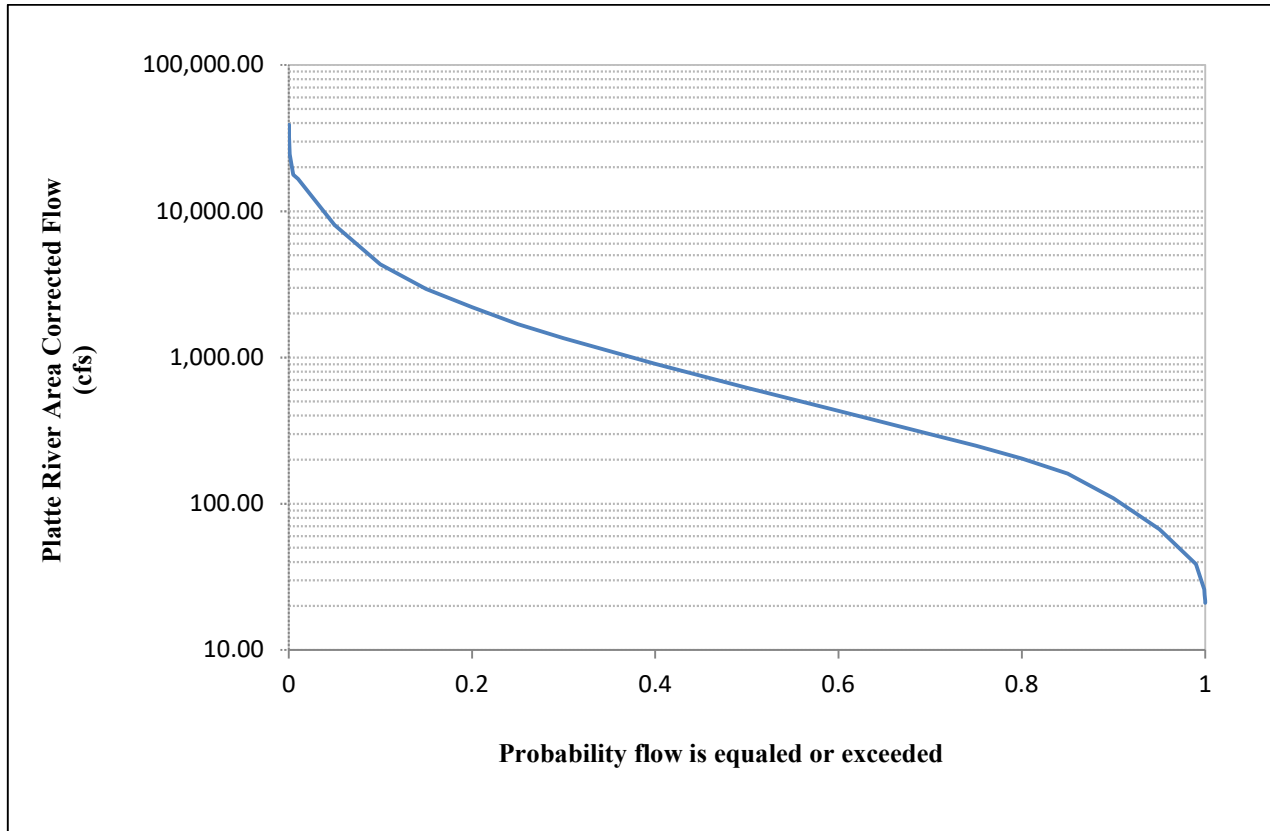


Figure B-1. Platte River Flow Duration Curve



USGS Stream Gage 06821190 at Sharps Station. MoDNR File Photo July 2024



View of the Platte River at Sharps Station with a flow of 2,000 cfs. MoDNR File Photo July 2024